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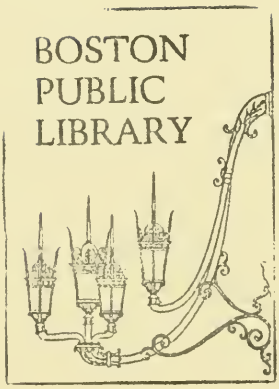
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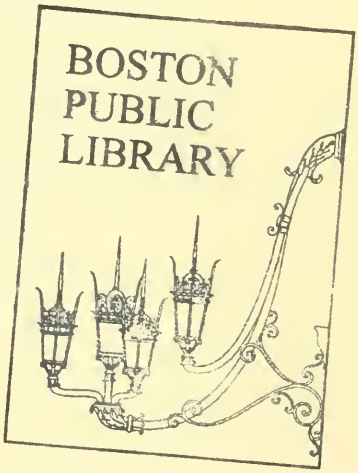
HYNES AUDITORIUM EXPANSION
BOSTON, MASSACHUSETTS

Final Report (Volume II – Part C)

Support Documentation

Code/ Fire Protection
Heating Ventilating & Air Conditioning
Plumbing
Electrical



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BOSTON REDEVELOPMENT AUTHORITY
Robert J. Ryan, Director

PUBLIC FACILITIES DEPARTMENT
Donald B. Manson, Director

Back Bay
B 65 M
1982

Final Report (Volume II – Part C)

Support Documentation

Table of Contents
Introduction
Code/Fire Protection
Heating Ventilating & Air Conditioning
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INTRODUCTION

The back-up data provided in this volume was used by the consultants in the design process for the Hynes Auditorium Expansion and serves as technical support for the contents of the consultants' reports in Volume I/Architectural and Engineering Summary portion of the Final Report.

Support Documentation

Code/Fire Protection

Firepro Inc.

INDEX

Existing Conditions- Analysis of Means of Egress

Conceptual Fire Defense Program - Option IV A
- Structural Fire Resistance
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- Barriers to Horizontal Fire Spread
- Fire Detection and Alarm System
- Means of Egress
- Automatic Sprinkler Systems
- Smoke Control Systems

FIREPRO File: 6K1202 December 28, 1982

EXISTING CONDITIONS

Analysis of Means of Egress

An approximate analysis of the relation between building population and exit capacity indicates three significant problems exist with respect to the means of egress system.

The anticipated population of the Second Level exhibit and meeting room spaces exceeds the capacity available in enclosed exit stairs, unenclosed monumental stairs and doors into the Sheraton Boston.

On the Main Level, the anticipated population does not exceed the exit capacity available on that floor. However, the number of persons from the Second Level who will use open stairs to the Main Level must be added to the Main Level population. This total population of persons using Main Level doors to the outside does exceed the capacity of the doors available.

The distribution of exits on the Main Level does not match the population distribution. Specifically, a high percentage of the exit capacity available is concentrated at the main entrance/exit lobby at the corner of Boylston and Dalton Streets while the building population will be relatively uniformly distributed throughout the building.

CONCEPTUAL FIRE DEFENSE PROGRAM
Option IV A

The fire defense features of the expanded and renovated Hynes Auditorium will be required to comply with the Massachusetts State Building Code (MSBC), 4th Edition. Article 22 of the MSBC concerning the renovation and expansion of the existing building provides general requirements applicable to this project. Sections 2200.0, 2201.0, 2202.0 and 2203.0 are the specifically applicable sections of this Article which affect the Hynes Auditorium project.

For all practical purposes, these sections require that both the new and existing portions of the facility must comply with the requirements of the main body of the Building Code for new construction. As further details of the renovation work are developed, it may be that portions of Article 22 will allow relaxation of the strict requirements for new construction in the areas of the existing facility being renovated. No attempt has been conducted to date to identify such specific details for the portions of the facility being renovated.

The following discussion identifies the primary requirements of the MSBC which will impact upon this building.

Structural Fire Resistance

The existing Hynes Auditorium is of fire resistive construction, construction Type 1A as described in the MSBC, Table 214. Strict height and area limitations of the Building Code as documented in Table 305 and Exceptions to that Table would require the building to be of Type 1A or 1B construction. It is anticipated Type 1A construction will be utilized to match the construction classification of the existing portions of the facility.

Barriers to Vertical Fire Spread

The floor assembly will have a fire rating of 3 hours in accordance with the requirements for Type 1A construction. Shafts penetrating these floor systems for enclosed stairs and for mechanical and electrical systems will have a 2 hour fire rating.

The facility will be arranged in accordance with Article 437.0, Open Wells, including subsections 437.2 concerning atriums and Section 616.8, Supplemental Stairs, to permit the multiple levels of the facility to be interconnected. The atrium requirements will be applied to the Grand Lobby, East Lobby and

South Lobby areas. The supplemental stairs section will be applied to the escalators between exhibition spaces on the Main Level and the Second Level.

Barriers to Horizontal Fire Spread

Two hour fire partitions will be provided which separate the Second Level auditorium from the adjacent Second Level exhibition space and the Third Level portions of the auditorium from the Third Level conference/exhibition space.

One hour fire rated partitions will be used to separate meeting rooms from adjacent prefunction areas serving as exit access corridors.

One hour fire rated partitions or smoke stop partitions which may include plain glass will be used to separate the exhibition and meeting spaces of the Lower Level, Main Level, Second Level and Third Level from the lobbies of the building arranged as atriums.

Figures No. 1 through 5 illustrate the location of fire rated or smoke stop partitions.

Fire Detection and Alarm System

A new fire detection and alarm system will be provided for the facility. Conceptually, this system will be subdivided into zones on a floor by floor basis and into additional zones related to the three lobbies and other major functional areas. Table No. 1 provides a general listing of the primary fire alarm system zones. Figures No. 7 through 11 illustrate the arrangement of these zones.

Within each zone, additional distinct zones will be provided for automatic fire detectors other than waterflow detectors (smoke detectors, heat detectors), waterflow detectors and manual pull stations.

Alarms from automatic or manual fire detection devices will be used to initiate a variety of building system reaction including transmission of fire alarms to the Boston Fire Department, activation of evacuation signals in the entire building. Other building system reactions may include release of hold-open devices for doors in fire rated and smoke stop partitions, activation of smoke control systems, shut down of affected HVAC systems, and start-up of the fire pump of the automatic sprinkler and standpipe and water supply systems.

Figure No. 6 is a matrix which documents the types of detection devices provided and the primary building system reactions upon alarm of those detection devices.

The fire alarm system will also be utilized to provide supervisory functions for primary elements of the fire protection systems of the building. These elements are also listed in Figure No. 6.

In addition to these automatic functions of the fire alarm system, manual controls for use by the Boston Fire Department will be provided for the fire alarm system, elevators, smoke control equipment and some other elements of the fire protection system.

Means of Egress

The means of egress system for the Hynes Auditorium is based upon a number of enclosed interior stairs leading to discharge through lobbies, exit discharge passageways or directly to the exterior at various levels of the building. This is a result of the change in grade of the site around the building. In addition, because multiple levels have access to the exterior, doors directly to the exterior are provided on several levels.

Limited use of horizontal exits into the Sheraton Boston Hotel is anticipated by this exiting scheme.

Horizontal exits may also be developed within the facility on the Second and Third Levels. The effect of such internal horizontal exits is to subdivide the building population requiring immediate evacuation and to provide additional exit capacity without adding new stairs.

Tables 2, 3, 4 and 5 provide data to permit analysis of the balance of exit capacity against building population on a floor by floor basis. Basic information used in that analysis is indicated directly in Tables or as Notes to Tables.

This analysis indicates the need for more exit capacity than provided by the current design. When internal horizontal exits are provided, the balance of population and exit capacity on a fire area by fire area basis is acceptable for all areas except the third floor south conference/exhibition area. For the third floor south, the excess of population over exit capacity is approximately 800 persons. A combination of additional stair capacity, such as by providing access to Stair 12, plus additional horizontal exit capacity, should permit this problem to be resolved.

The exit discharge arrangements for the Hynes Auditorium and for the Sheraton Boston Hotel in the South Lobby-Retail area (also referred to as the West Court of the Prudential Plaza) have been reviewed. Although multiple paths from that area to grade are available, the capacity of those paths, as in the present

design, is not sufficient. Additional capacity may be develped by pulling the east end of the new retail space back to the line of the east side of Commercial Block A or widening the stairs which currently exist at the south end of the open space between the Sheraton Boston Hotel and Commercial Block A. Additional study to fully resolve these problems will be needed in the future design effort.

Automatic Sprinkler Systems

The facility will be provided with complete automatic sprinkler coverage using several automatic sprinkler systems with a common water supply and distribution system. The water supply system will also serve Fire Department hose connections on standpipes within stairwells.

Water will be supplied to the building from city mains on Boylston Street and Dalton Street. These connections will be manifolded together to supply a minimum of two electrically driven fire pumps. The fire pumps as well as a pump bypass will supply distribution piping to standpipes in enclosed exit stairs and at other locations as required for adequate coverage of the facility.

Automatic sprinkler systems will be connected to the standpipe risers and zoned as listed in Table No. 1 and as illustrated in Figures No. 7 through 11 for fire alarm system zones.

Smoke Control Systems

Exhaust fans will be provided at the highest levels of the Grand and East Lobbies to provide smoke exhaust capability in accordance with the atrium section of the MSBC. Other HVAC equipment may be used for smoke control purposes. Any equipment not so used will be automatically shut down to prevent recirculation of smoke which enters the HVAC system.

The South Lobby escalator will be equipped with an exhaust system which has intakes on each floor near the escalator opening. This system will be designed in accordance with the Massachusetts State Elevator Code.

TABLE NO. 1

Primary Fire Alarm System
Detection Zones

	Zone	Area	SUBZONES Waterflow	Smoke Detectors	Manual Pull Sta.
Third Level (See Figure No. 6)	3-1	Grand Lobby	●	●	●
	3-2	Conf./Exh./Mtg./Pref.	●		●
	3-3	East Lobby	●	●	●
	3-4	Mechanical	●		●
Second Level (See Figure No. 7)	2-1	Grand Lobby	●	●	●
	2-2	Auditorium	●		●
	2-3	Boylston Street Mtg. Rooms	●		●
	2-4	Exhibition	●		●
	2-5	East Lobby	●	●	●
	2-6	East Meeting Rooms	●		●
	2-7	South Lobby/Meeting Rooms	●	●	●
Main Level (See Figure No. 8)	M-1	Grand Lobby	●	●	●
	M-2	West Exhibition	●		●
	M-3	Central Exhibition/Pref.	●		●
	M-4	East Lobby	●	●	●
	M-5	East Meeting Rooms	●		●
	M-6	South Lobby	●	●	●
Street Level (See Figure (No. 9)	S	East Lobby	●	●	●
Lower Level (See Figure No. 10)	L-1	Meeting Rooms	●		●
	L-2	East Lobby	●	●	●
	L-3	Existing Loading Dock/Support	●		●

TABLE NO. 2
Approximate Population Calculation
Building Basis

	Area (sf)	Density (sf/p)	Population (p)
Third Level			
Conf./Exhib.	35,250	7	5035
C/E Prefunction	7,320	-	-
Meeting 3A	2,700	7	321
Meeting 3B	2,250	7	314
Meeting 3C	2,200	7	771
Meeting 3D	5,400	-	-
Prefunction	11,232	-	-
East Lobby	8,248	-	-
Grand Lobby	10,300	-	-
TOTAL			6,441
Second Level			
Exhibition	52,096	15	3473
Auditorium	30,000	Anticipated Actual Seating	4000
Audit. Balcony	6,512	7	930
Aud. Prefunction	11,400	15	760
Grand Lobby	10,300	-	-
Meeting 2A	7,448	7	1064
Meeting 2B	9,500	7	1357
Meeting 2C	3,364	7	487
Meeting 2D	5,220	7	746
Meeting 2E	3,364	7	487
Prefunction 2A/2B	9,360	-	-
Prefunc. 2C/2D/2E	7,980	-	-
East Lobby	7,204	-	-
South Meeting	4,500	7	643
South Lobby	7,520	-	-
TOTAL			13,017
Main Level			
East Exhibition	54,925	15	3662
West Exhibition	46,440	15	3096
Grand Lobby	6,624	-	-
Prefunction	10,186	-	-
East Lobby	4,628	-	-
Meeting MA	5,568	7	795
Meeting MB	3,712	7	530
Meeting MC	2,900	7	414
East Prefunction	6,896	-	-
South Lobby	3,960	-	-
TOTAL			8,497
Street Level			
Lobby	4,952	-	-
Lower Level			
Meeting LA	3,910	7	559
Meeting LB	3,840	7	406
Meeting LC	2,640	7	377
Prefunction	8,008	-	-
Lobby	5,432	-	-
TOTAL			1,342

FIREPRO File: 6K1202 December 28, 1982

TABLE NO. 3

Available Exit Capacity
Building Basis

(Stair and Door Designations provided on Figures No. 1 to 5)

	Exit	uew	x	p/uew	=	Exit Capacity (p)
Third Level	S2	3	x	113	=	339
	S3	3	x	113	=	339
	S5	5	x	113	=	565
	S7	3	x	113	=	339
	S8	3	x	113	=	339
	S9	3	x	113	=	339
	S10	6	x	113	=	678
	S11	5	x	113	=	565
	S13	4	x	113	=	452
	Total Exit Capacity					3,955
Second Level	S2	3	x	113	=	339
	S3	3	x	113	=	339
	S5	5	x	113	=	565
	S6	3	x	113	=	339
	S7	3	x	113	=	339
	S8	3	x	113	=	339
	S9	3	x	113	=	339
	S10	6	x	113	=	678
	S11	5	x	113	=	565
	S12	4	x	113	=	452
	S13	4	x	113	=	452
	S14	6	x	113	=	678
	Subtotal Exit Capacity for Stairs					5,424
	D5	3	x	150	=	450
	D6	9	x	150	=	1,350
	D7	3	x	150	=	450
	Subtotal Exit Capacity for Doors					2,250
	Total Exit Capacity					7,674

TABLE NO. 3 (cont'd)

	Exit	uew	x	p/uew	=	Exit Capacity (p)
Main Level	S2	3	x	113	=	339
	S3	3	x	113	=	339
	S6	3	x	113	=	339
	S7	3	x	113	=	339
	S8	3	x	113	=	339
	S9	3	x	113	=	339
	Subtotal Exit Capacity For Stairs					2,034
	D2	15	x	150	=	2,250
	D3	9	x	150	=	1,350
	D4	12	x	150	=	1,800
	D8	3	x	150	=	450
	D9	3	x	150	=	450
	D10	3	x	150	=	450
	Subtotal Exit Capacity For Stairs					6,750
	Total Exit Capacity					8,784
Street Level	D1	36	x	150	=	5,400
Lower Level	S1	3	x	113	=	339
	S2	2	x	113	=	339
	S3	3	x	113	=	339
	S4	3	x	113	=	339
	Total Exit Capacity				=	1,356

TABLE NO. 4

Approximate Population and Exit Capacity Calculations

Fire Area Basis

Second & Third Levels Fire Area	Popula- tion	Exit Capacity Stair & Doors To Sheraton(p)	Exit Capacity Internal Horizontal Exits(p)(5)	Total Exit Capa- city(p)
Third Level South				
Conf./Exhibition	5035	2147[1]	2147	4294
Third Level North				
C/E Prefunction	-			
Meeting Rooms	1406			
Prefunction	-			
East Lobby	-			
Grand Lobby	-			
TOTAL	1406	1808[2]	1808	3616
Second Level East				
Exhibition	3473			
Meeting Rooms	4784			
Prefunction	-			
East Lobby	-			
South Lobby	-			
TOTAL	8257	4738[3]	4738	9476
Second Level West				
Auditorium				
(incl. Balcony)	4000			
Aud. Prefunction	760			
Grand Lobby	-			
TOTAL	4760	2936[4]	2936	5872

NOTES: (1) Stairs S7, S8, S9, S10, S13
(2) Stairs S2, S3, S5, S11
(3) Stairs S2, S3, S8, S9, S10, S12, S13/Doors D5, D6
(4) Stairs S5, S6, S7, S11, S14/Door D7
(5) Horizontal exit capacity for a specific fire area may not exceed the exit capacity available using other exit paths (stairs, doors to Sheraton).

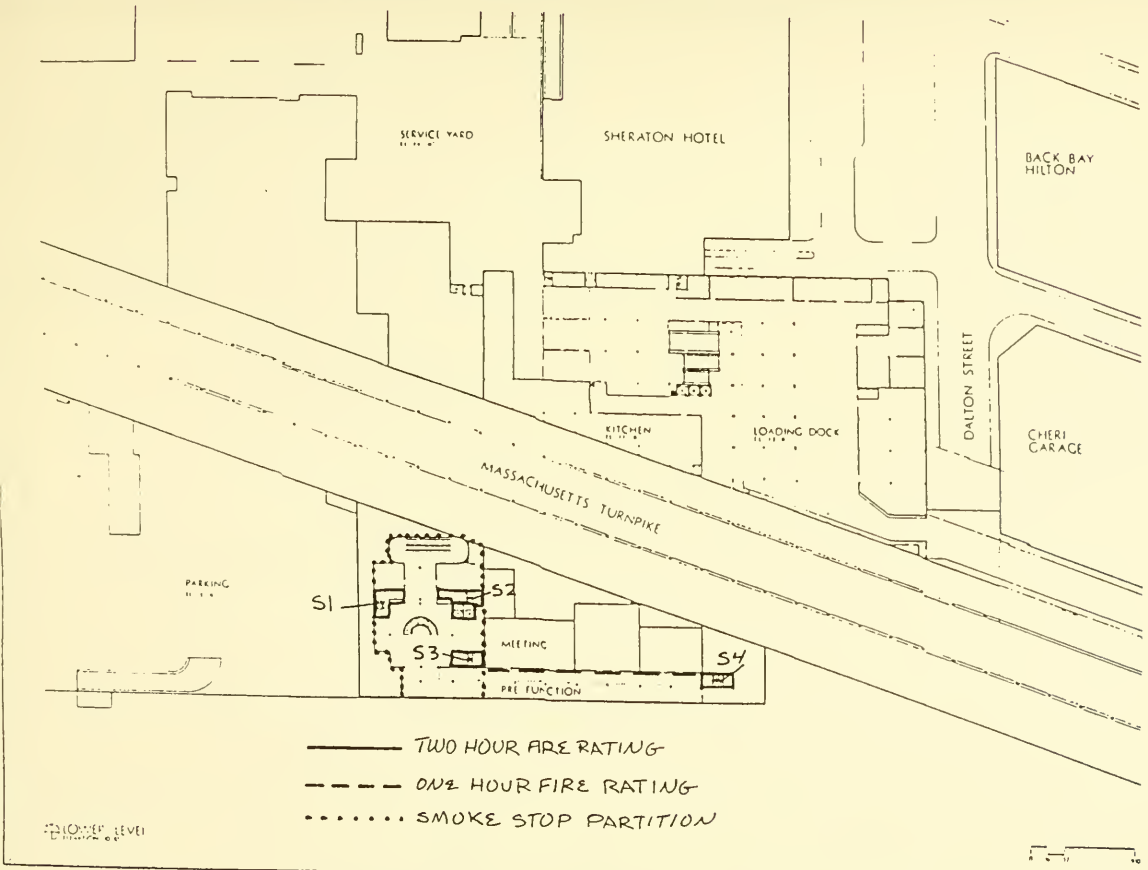
TABLE NO. 5
SUMMARY

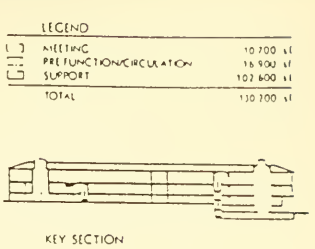
Approximate Exit System Analysis

Level	Population	Option IV-A Floor By Floor Exit Capacity*	Option IV-A Fire Area by Fire Area Exit Capacity**
Third			
South	5,035	-	4,294
North	1,406	-	3,616
TOTAL	6,441	3,955	-
Second			
East	8,725	-	9,476
West	4,760	-	5,872
TOTAL	13,017	7,674	-
Main	8,497	8,784	784
Lower	1,342	1,356	1,356

* Based upon Option IV-A arrangement of stairway exits and horizontal exits into The Sheraton Boston Hotel.

** Based upon subdivision of Levels Two and Three to allow use of internal horizontal exit concept.





HYNES AUDITORIUM

FIRE PARTITION LOCATIONS
EXIT STAIR AND DOOR DESIGNATIONS

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FIG. NO. 1

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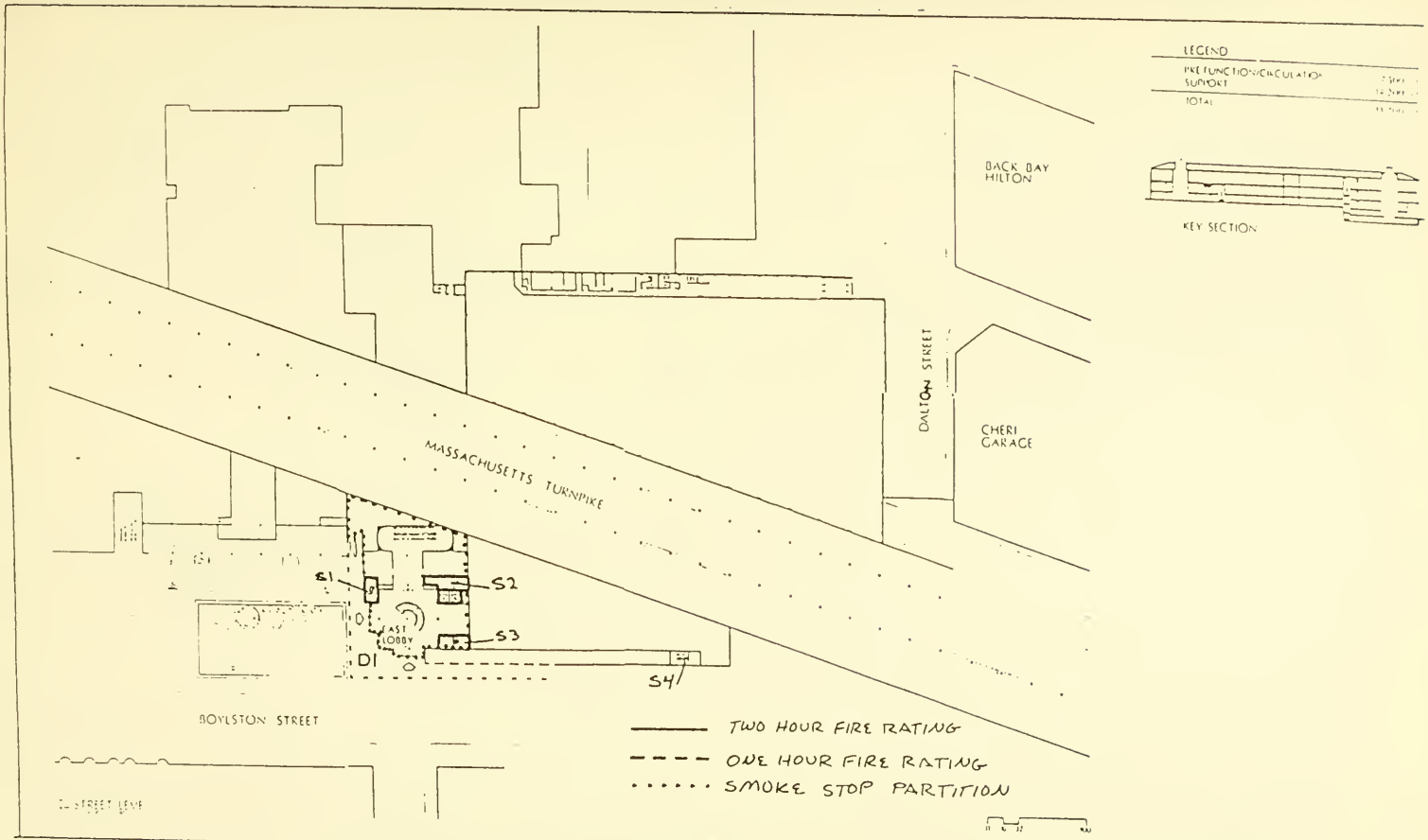

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FIRE PARTITION LOCATION
EXIT STAIR AND DOOR DESIGNATIONS

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FIG. NO. 2

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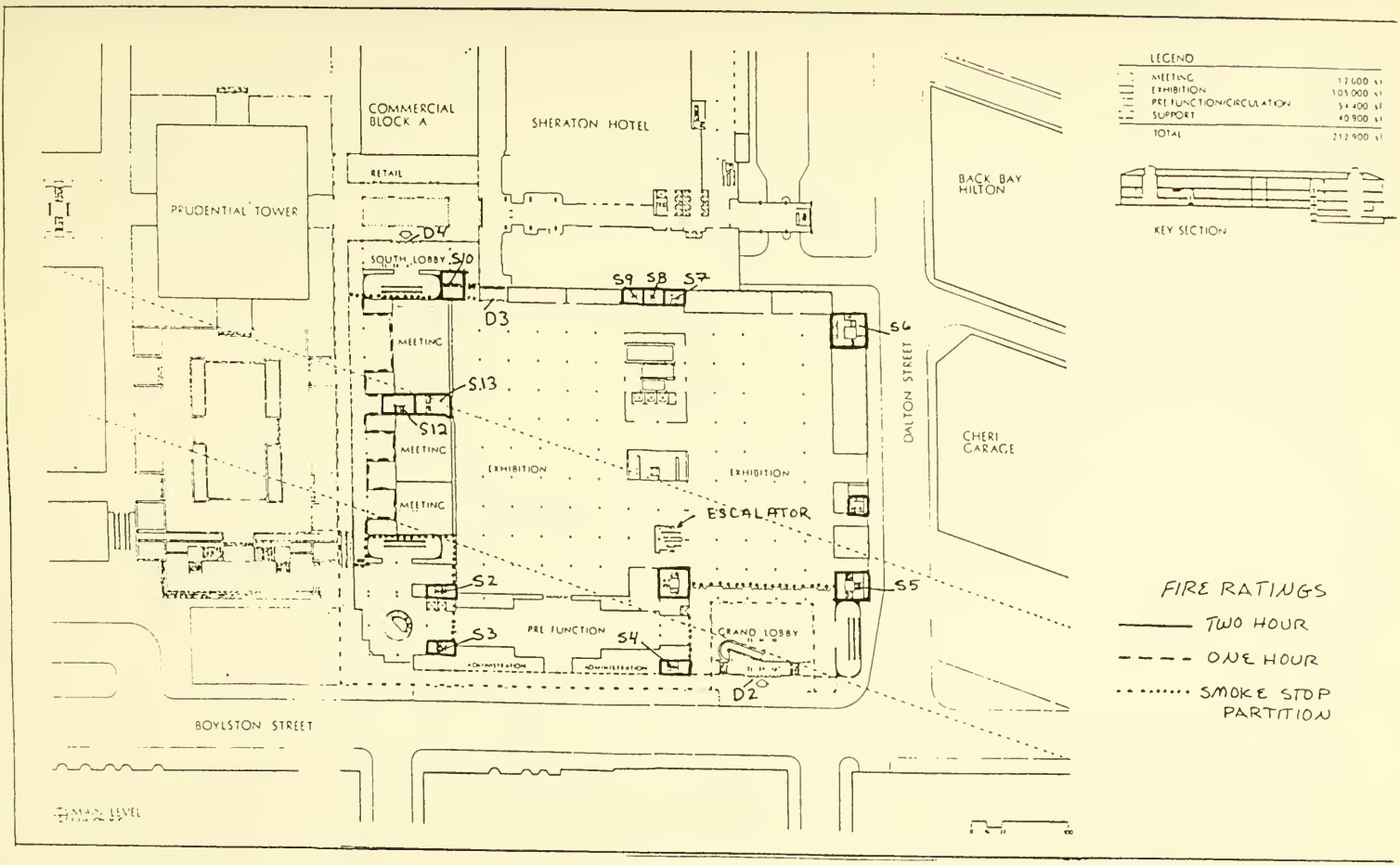

HYNES AUDITORIUM

FIRE PARTITION LOCATIONS
EXIT STAIR AND DOOR DESIGNATIONS

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FIG. NO. 3

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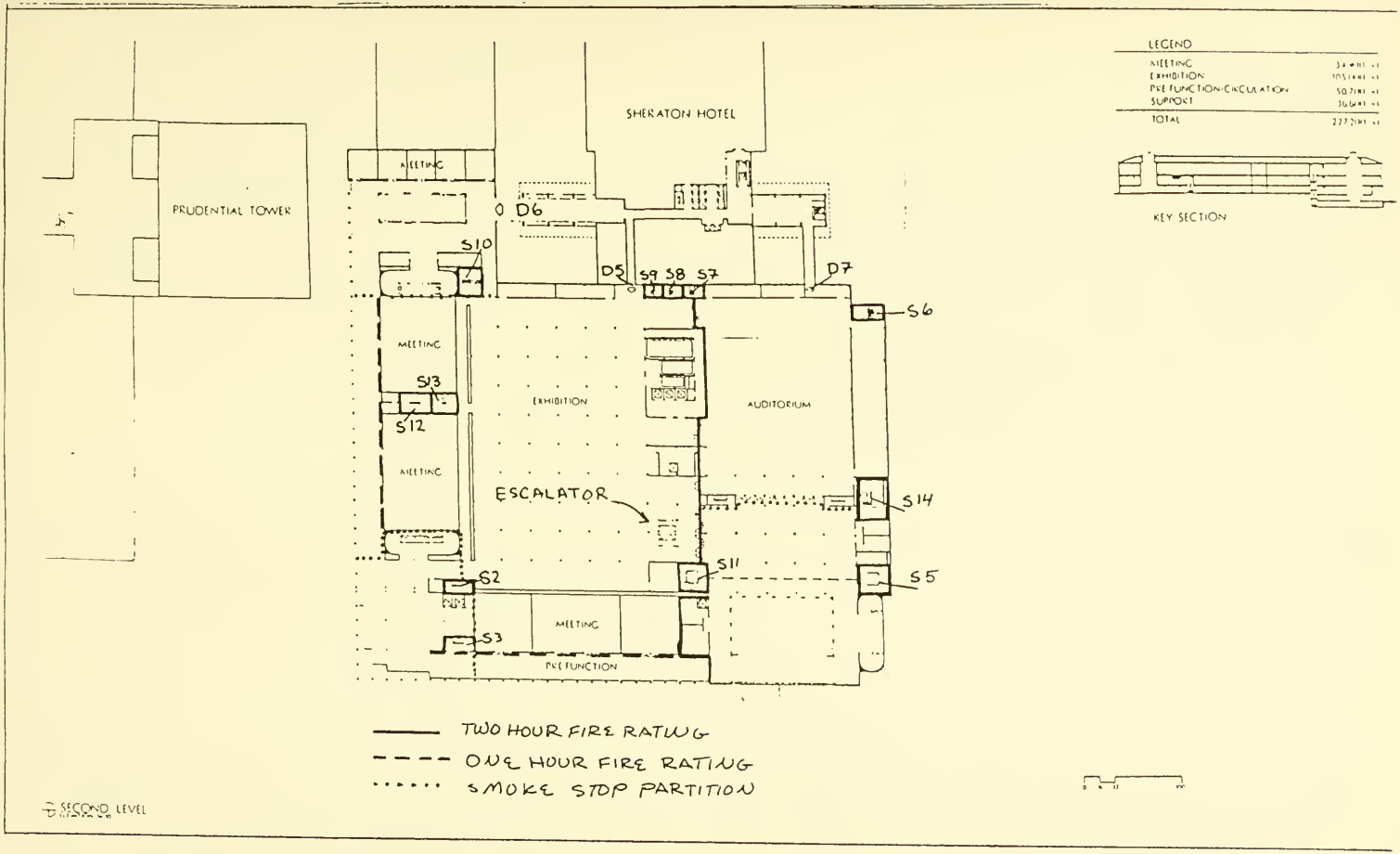

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FIRE PARTITION LOCATIONS
EXIT STAIR AND DOOR DESIGNATIONS

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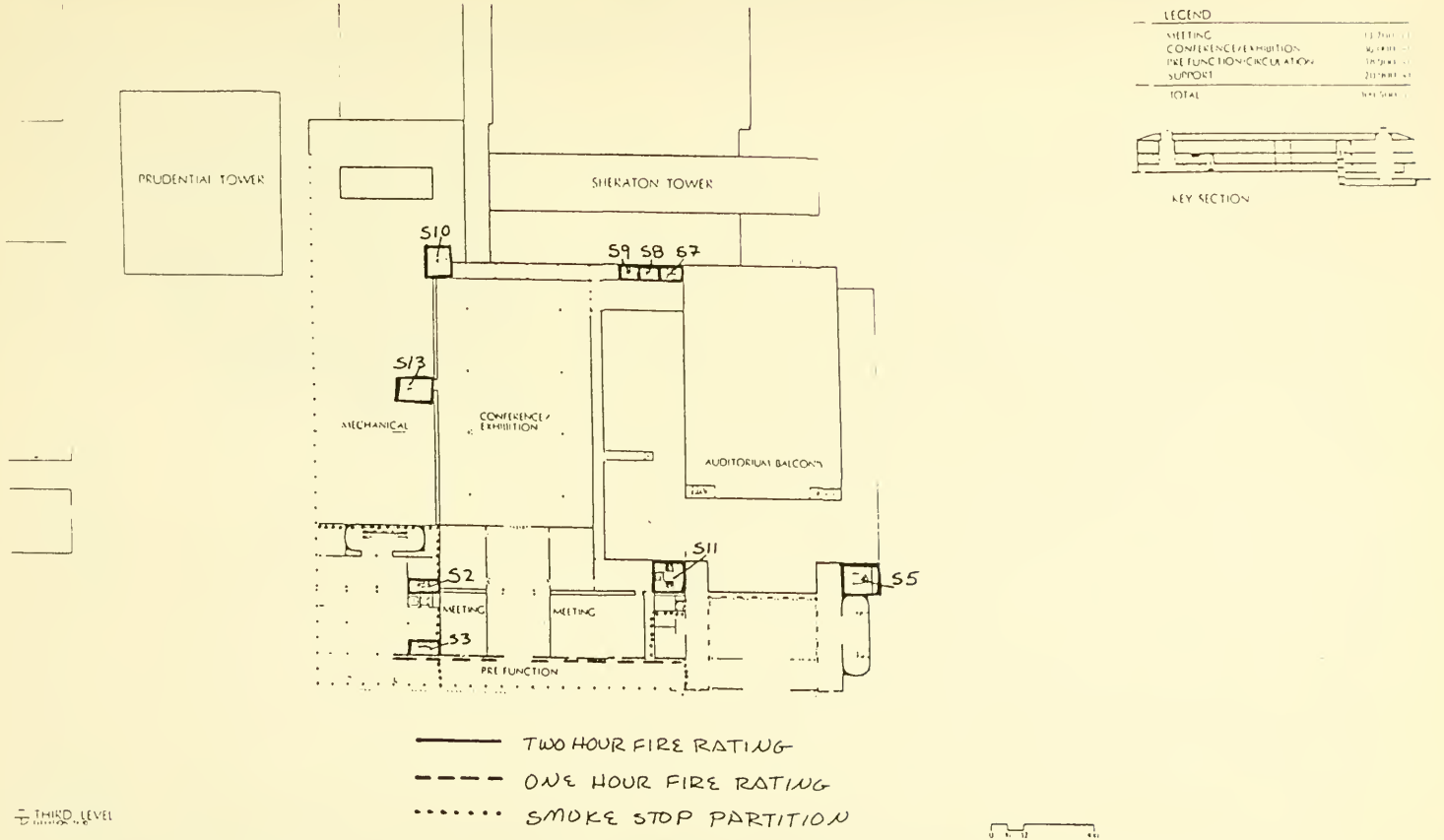

HYNES AUDITORIUM

FIRE PARTITION LOCATIONS
EXIT STAIR AND DOOR DESIGNATIONS

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FIG. NO. 5

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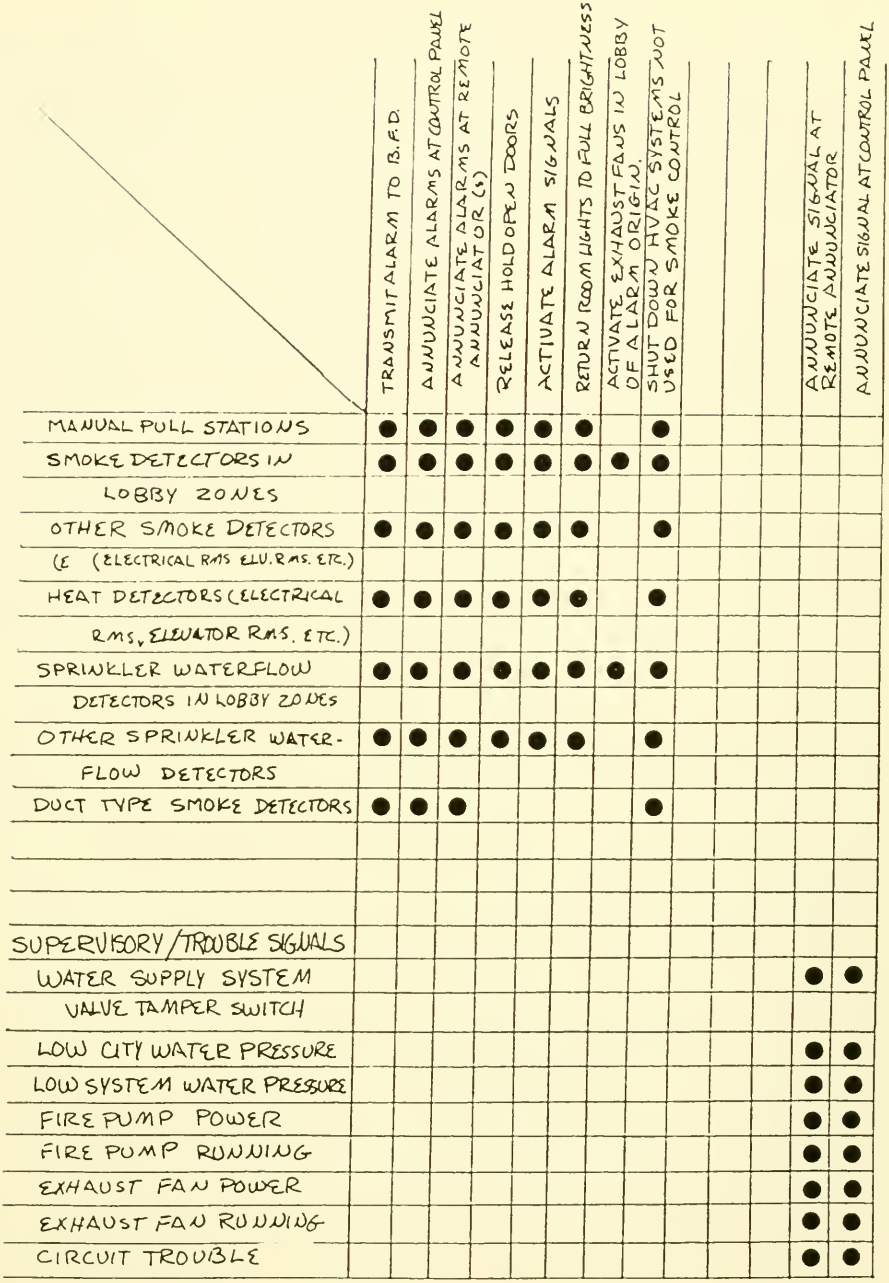

	TRANSMIT ALARM TO B.F.D.	ANNUNCIATE ALARMS AT CONTROL PANEL	ANNUNCIATE ALARMS AT REMOTE ANNUNCIATOR (S)	RELEASE HOLD OPEN DOORS	ACTIVATE ALARM SIGNALS	RETURN ROOM LIGHTS TO FULL BRIGHTNESS	ACTIVATE EXHAUST FANS IN LOBBY OF ALARM ORIGIN.	SHUT DOWN HVAC SYSTEMS NOT USED FOR SMOKE CONTROL				ANNUNCIATE SIGNAL AT REMOTE ANNUNCIATOR	ANNUNCIATE SIGNAL AT CONTROL PANEL
MANUAL PULL STATIONS	●	●	●	●	●	●		●					
SMOKE DETECTORS IN LOBBY ZONES	●	●	●	●	●	●	●	●					
OTHER SMOKE DETECTORS (E (ELECTRICAL RMS ELV. RMS. ETC.)	●	●	●	●	●	●		●					
HEAT DETECTORS (ELECTRICAL RMS, ELEVATOR RMS. ETC.)	●	●	●	●	●	●		●					
SPRINKLER WATERFLOW DETECTORS IN LOBBY ZONES	●	●	●	●	●	●	●	●					
OTHER SPRINKLER WATER-FLOW DETECTORS	●	●	●	●	●	●		●					
DUCT TYPE SMOKE DETECTORS	●	●	●					●					
SUPERVISORY/TROUBLE SIGNALS													
WATER SUPPLY SYSTEM VALVE TAMPER SWITCH												●	●
LOW CITY WATER PRESSURE												●	●
LOW SYSTEM WATER PRESSURE												●	●
FIRE PUMP POWER												●	●
FIRE PUMP RUNNING												●	●
EXHAUST FAN POWER												●	●
EXHAUST FAN RUNNING												●	●
CIRCUIT TROUBLE												●	●

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BASIC FIRE ALARM SYSTEM OPERATIONS

FILE 6K.1202 DATE 12.14.82
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FIG. NO. 6

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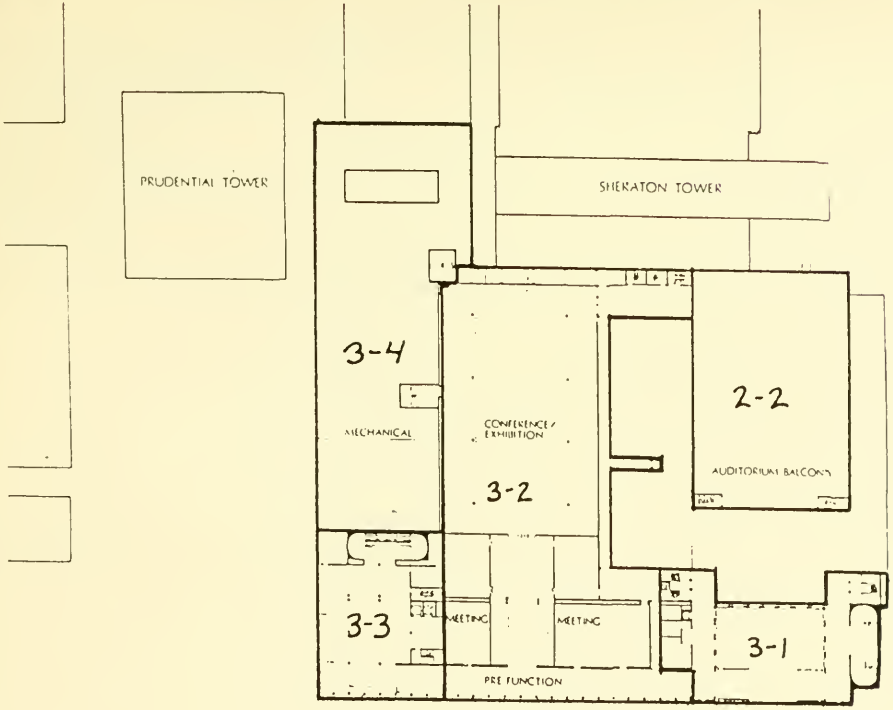
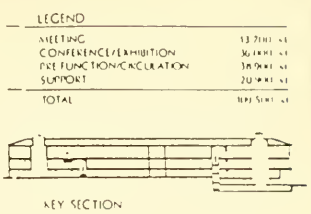


THIRD LEVEL



HYNES AUDITORIUM

FIRE ALARM SYSTEM ZONING

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FIG. NO. 7

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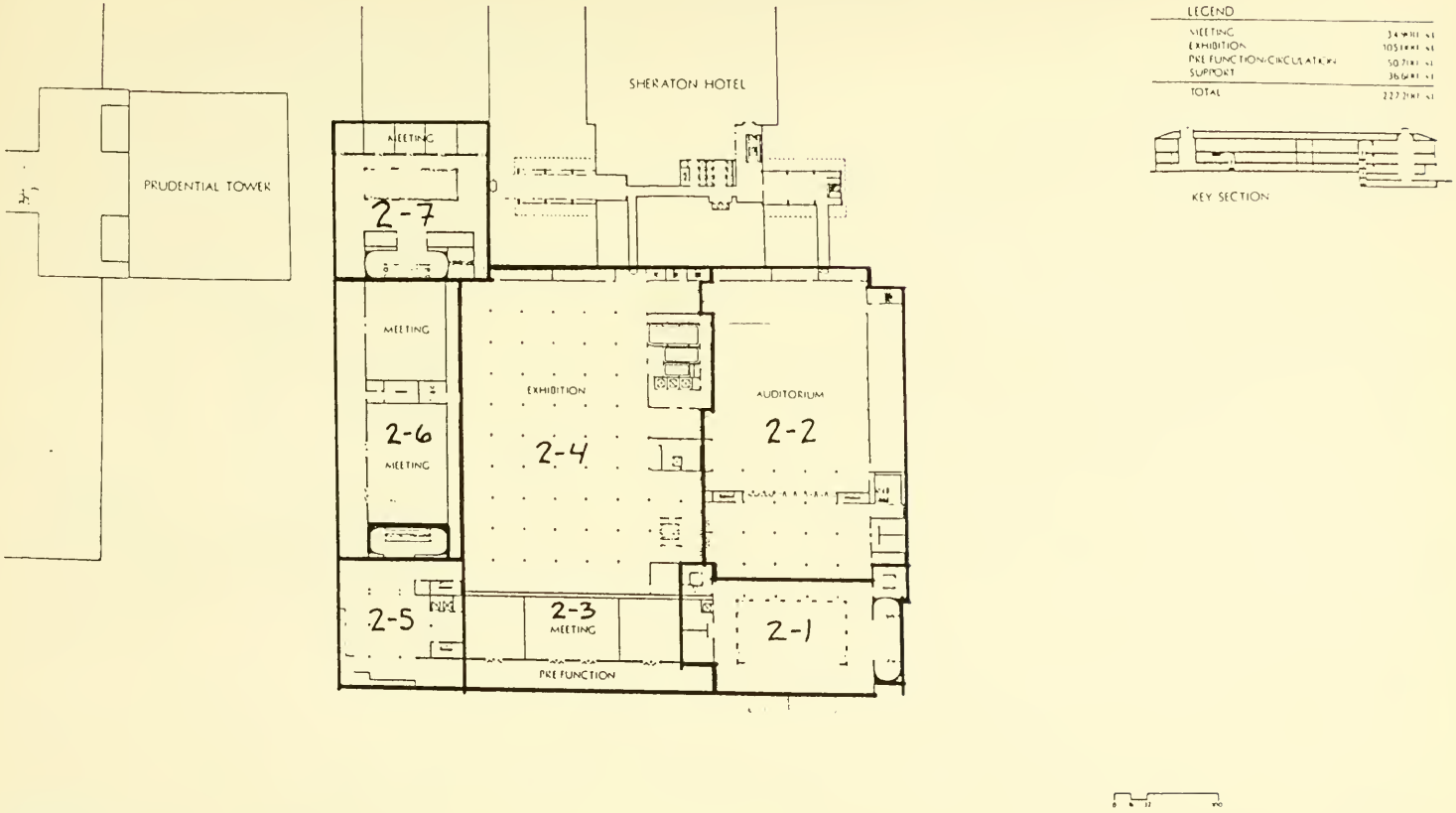

SECOND LEVEL

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FIRE ALARM SYSTEM ZONING

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FIG. NO. 8

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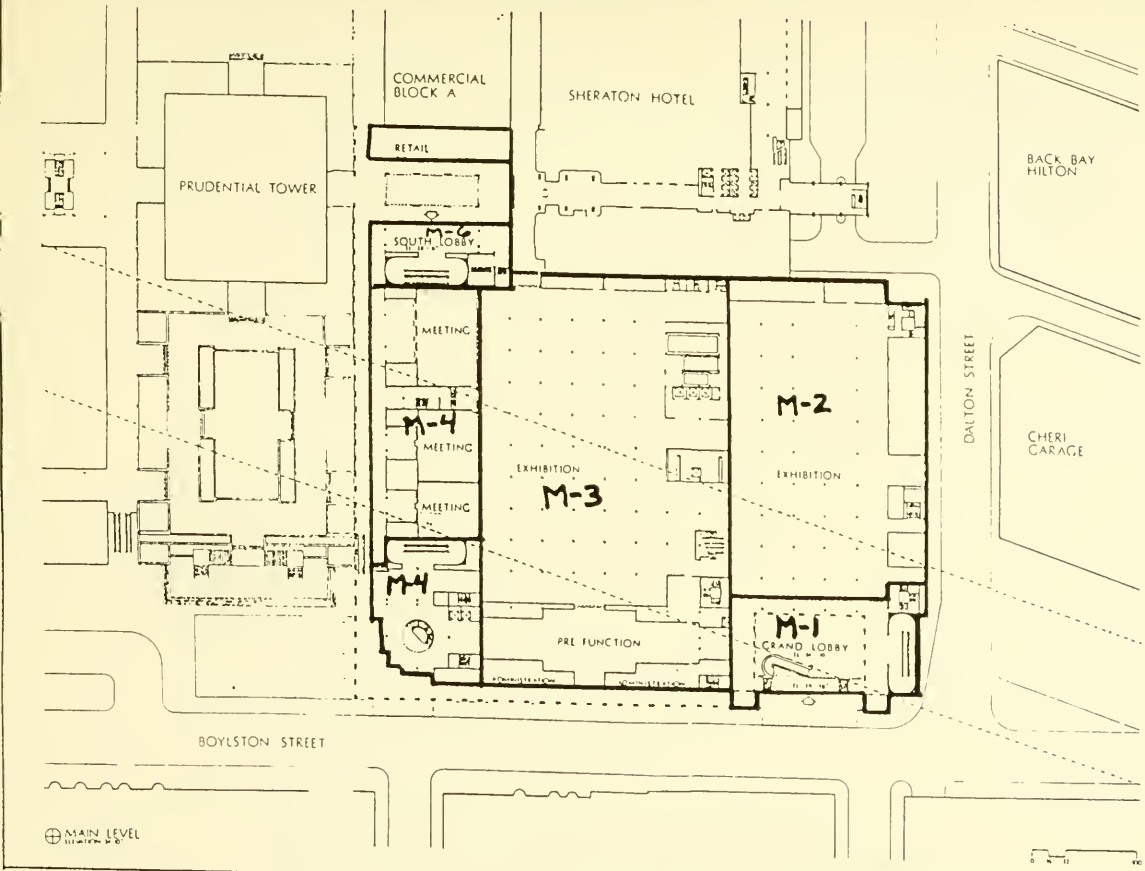
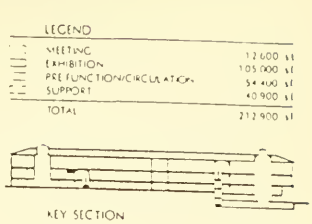




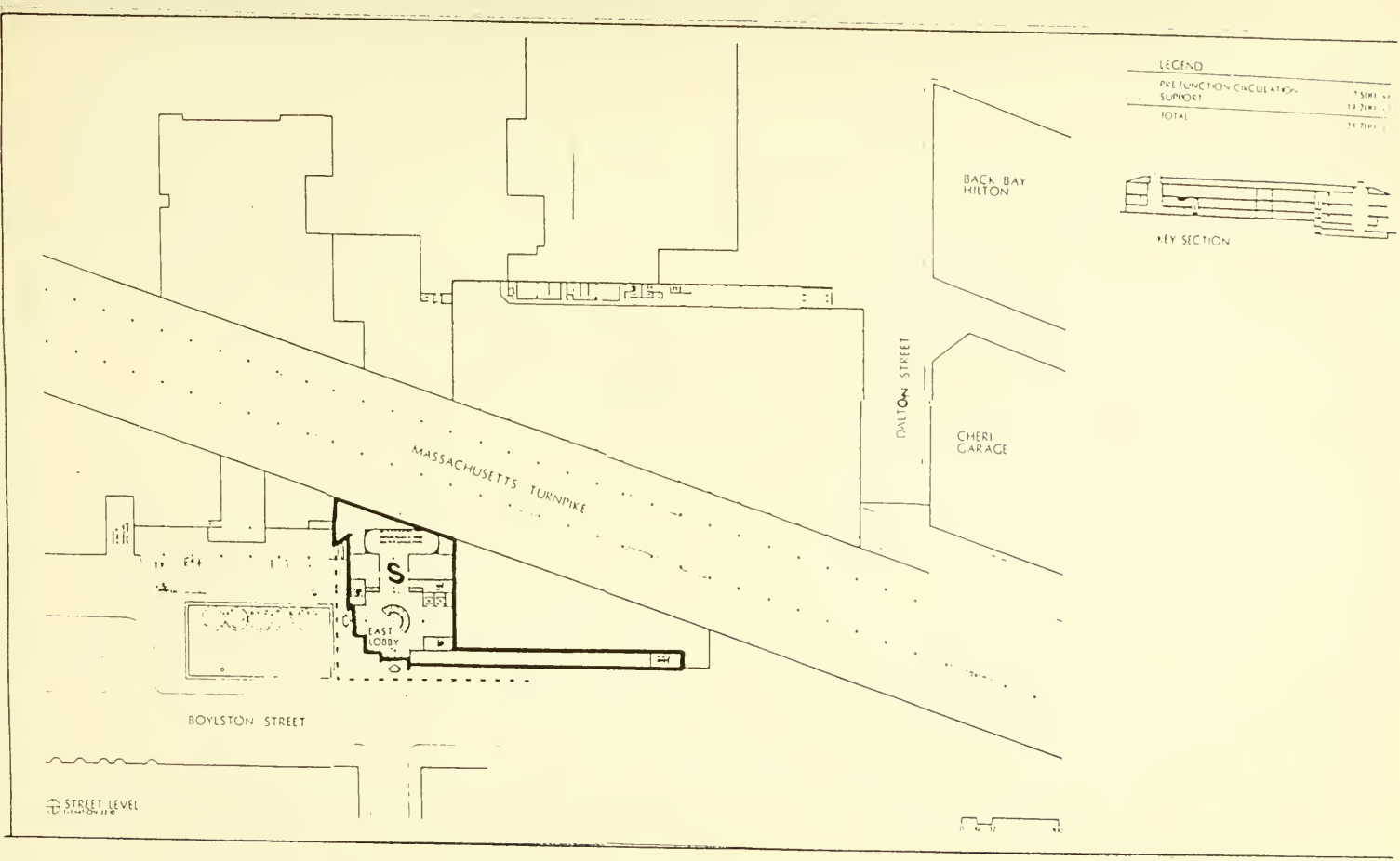
HYNES AUDITORIUM

FIRE ALARM SYSTEM ZONING

file 6K.1202 | date 12.14.82 | drawn LAH | chk'd HRC

FIG. NO. 9

FIREPRO Incorporated
Postal Box 145
Telephone (617) 237-1153
Wellesley Hills, Massachusetts 02181



HYNES AUDITORIUM	FIRE ALARM SYSTEM ZONING	file 6K.1202	date 12.14.82	FIG. NO. 10
		drawn LAH	chk'd HRC	

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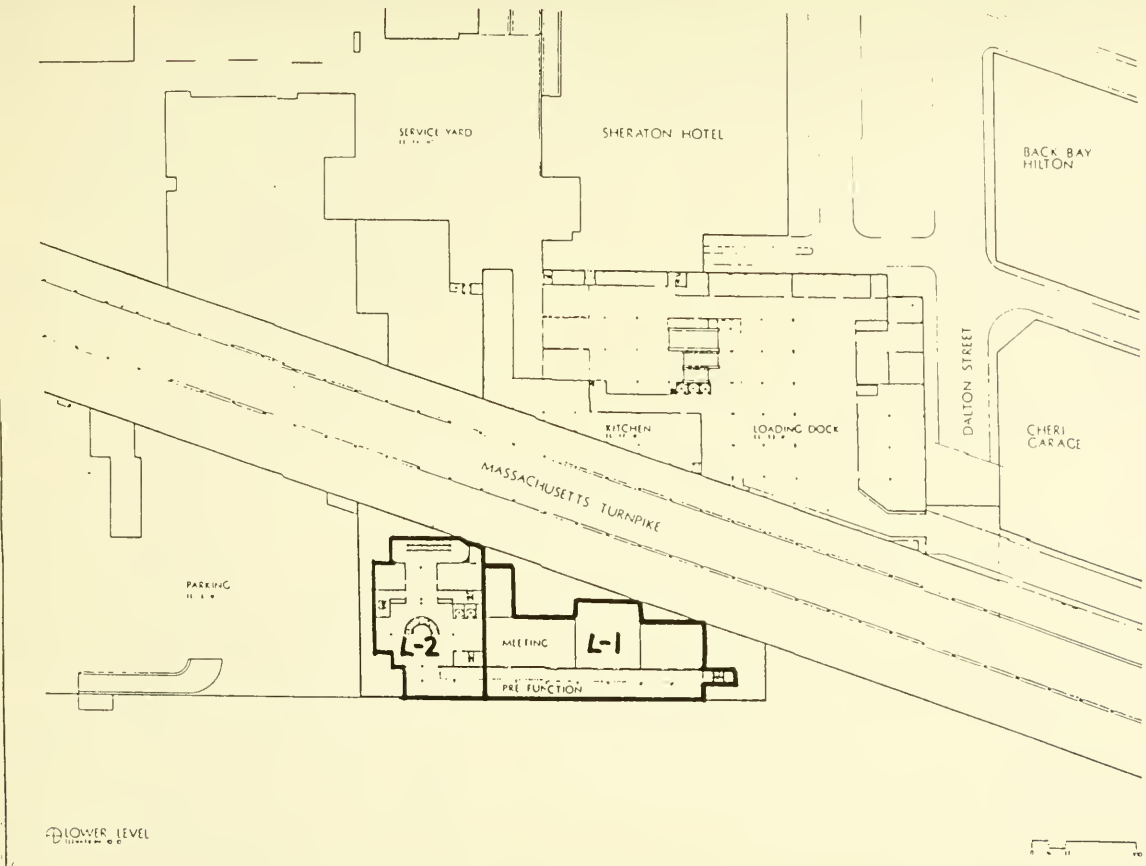
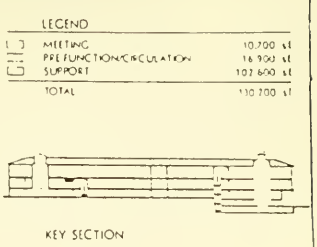




HYNES AUDITORIUM	FIRE ALARM SYSTEM ZONING	file 6E.1202	date 12.14.82
		drawn LAH	chk'd HRC

FIG NO. 11

FIREPRO Incorporated

Postal Box 145

Telephone (617) 237-1153

Wellesley Hills, Massachusetts 02181

Support Documentation

Heating Ventilating & Air Conditioning

TMP Consulting Engineers Inc.

VI. SUPPORT DOCUMENTATION

TABLE 1: EXISTING STEAM CONNECTED HEATING LOADS.

TABLE 2: EXISTING PUMPS.

TABLE 3: AIR CONDITIONING UNITS.

TABLE 4: MAINTENANCE COSTS.

TABLE 5: UTILITY OPERATING COSTS.

TABLE 6: PRELIMINARY AIR HANDLING UNIT CAPACITY REQUIREMENTS.

TABLE 1: EXISTING CONNECTED STEAM HEATING LOADS

	ITEM/SERVICE	LOAD #/HR.	COMMENTS
1.	5 convertors - (steam to Hot Water)	5740	See Note #1
2.	H&V Units (O.A. Makeup)	5085	
3.	Preheat	6612	
4.	Reheat	7889	See Note #2
5.	Misc.	589	
	Total	25915	See Note #2

NOTES:

1. Actual heating load associated with convectors is only 1080#/Hr. The remaining 4660 #/HR. is for freeze protection which would not be a serious concern at the reduced outside quantities anticipated in our final design.

2. Reheat load not additive simultaneously with other loads thus explaining why total does not match PRV sizing.

TABLE 2: EXISTING PUMPS

PUMP	SERVICE	GPM	HP	REMARKS
P-1	Chilled Water	1200	60	
P-2	" "	1200	60	Standby
P-3	" "	2400	100	
P-4	Condenser Water	3000	125	
P-5	" "	1500	60	
P-6	" "	1500	60	Standby
P-7	Hotwell Cond.	50	3	
P-8	" "	50	3	
P-9	" "	30	3	
P-10	" "	30	3	
P-11	Heating/C-1	46	2	
P-12	"	46	2	Standby
P-13	Heating/C-2	15	1/3	
P-14	" /C-3	43	3/4	
P-15	Freeze Prot/C-4	63	1/4	
P-16	" /C-5	830	15	

TABLE 3: AIR CONDITIONING UNITS

Unit #	Scheduled CFM	% of total	Location	Area Served	Remarks
1	34365	7.7	Penthouse	General Area	
2	42820	9.7	"		
3	45500	10.4	"		
4	37760	8.6	"		
5	45730	10.4	"		
6	45600	10.4	"		
7	40810	9.3	"		
8	34060	7.8	"		
9	30860	7.0	"		
10	33600	7.7	"		
11	23600	5.3	Penthouse		
12*	17260	3.9	App. Rm. #4		
13*	4310	1.0	App. Rm. #4	Meeting Rms. 232, 233, 234 (off Balcony)	Multizone Package Unit
14*	2440	0.5	Coat Rm. #176	Administration Area	Packaged Unit

Total Air: 438715

NOTES: (1) Scheduled CFM not intended to indicate existing.
(2) Refer to Balancing Report for present operating CFM.
(3) * Units requiring removal due to new construction. In addition, at least one of the other 11 units will require removal. The anticipated remaining air capacity is 380,000 CFM±.

TABLE 4: MAINTENANCE COSTS

			% Increase Over Base Year	% Increase Over Previous Year
Base Year:	1977	$ 82,461.46	- - -	- - -
	1978	$ 87,409.15	6%	6%
	1979	$ 87,409.15	- - -	- - -
	1980	$ 87,409.15	- - -	- - -
	1981	$139,000.00	68.5%	59%
	1982	$154,140.00	86.9%	10.9%
	1983	$199,500.00	141.9%	29.4%

TABLE 5: UTILITY OPERATING COSTS

	STEAM				ELECTRIC		
IME PERIOD	COSTS	1000# USE	COST/ 1000#		COSTS	1000KW USE	COST/KW
ly 78 - June 79	$173,178	23233	$ 7.45		$237,027	4046	5.8¢
ly 79 - June 80	$201,307	17566	$11.46		$311,880	4096	13.1¢
ly 80 - June 81	$164,651	12849	$12.81		$333,589	3679	11.8¢
ly 81 - June 82	$134,139	10061	$13.33		$413,581	4343	10.5¢

OTES: Table 5 information is from 2 different sources (Boston Edison and Public Facilities Department) not exactly the same but were generally similar. Table is shown to indicate general trends.

TABLE 6: PRELIMINARY AIR HANDLING UNIT

CAPACITY REQUIREMENTS

Space Use	Areas	Air Conditioning Block Loading	
Meeting Rooms	71,900	143,800 cfm	
Prefunction	168,400	421,000 cfm	
Exhibition	246,000	738,000 cfm	
Support	215,200	215,200 cfm	
Totals	701,500 sq. ft.	1,518,000 cfm	
	-10%	- 151,800	System Diversity
		1,366,200 cfm	
Approximate Existing A.C. Air Handling Capacity to Remain (pending further study).		- 380,000 cfm	(See Table #3 Note #3)
NEW AIR HANDLING CAPACITY		986,200 cfm	

B. PRELIMINARY AIR CONDITIONING CONSIDERATIONS

1. ASHRAE - NOTES ON CONVENTION CENTERS
   1978 Applications Chapter #4 Page 4.6
   1982 Applications Chapter #4 Page 4.7

---

a. Flexibility in system is key consideration due to variable use factor.

b. Industrial shows require highest load

Up to 20W/sq. ft	20 X 3.415 =	68.3 btu/sq. ft.
1 person/40/sq. ft.:	300/40 =	7.5 btu/sq. ft.
		75.8 btu/sq. ft.
Based on 22° Air Temp. Diff. =		3.2 cfm/sq. ft.

This load is high because most equipment does not operate simultaneously.

c. Exhibition Space Recommended Capacities:

System should accommodate:

EQUIPMENT: (Misc.)	10	w/sq. ft.
LIGHTS: (from Lottero & Mason)	5	w/sq. ft.
PEOPLE: 40 sq. ft./person	2.2	w/sq. ft.
Totals.	17.2	w/sq. ft. = 58.7 btu/sq. ft. = 2.47 cfm/sq. ft.

d. Determination of accurate occupancy and usage information is critical.

e. Multi-speed fans or variable volume must be a strong consideration due to varying loads.

f. Cooling coil selection should be made with the knowledge of highly variable latent load requirements.

g. Special Requirements:

(1) Systems should be capable of operating on 100% OA because during set-up time trucks can sometimes be driven directly into the space.

(2) Space can be used to exhibit and operate equipment with fumes, therefore, flues must be provided for direct removal of noxious odors.

h. Storage rooms can often be indirectly air conditioned by exhausting (returning) excess air from the main hall through the storage space.

VI. B. 2. Ventilation:

This facility will handle 8000 to 12000 people simultaneously.

ASHRAE standards for natural and mechanical ventilation are as follows:

SPACE DESCRIPTION	Sq. Ft./Person OCCUPANCY	CFM MINIMUM	CFM RECOMMENDED
1. Auditoriums (no smoking)	7 sq. ft.	5	5 - 10
2. Lobbies (Foyers and Lounges)	7 sq. ft.	20	25 - 30
3. Kitchens	50 sq. ft.	30	35
4. Rest Rooms	100 sq. ft.	15	20 - 25
5. Ballrooms	10 sq. ft.	15	20 - 25
6. Conference Rooms	17 sq. ft.	25	30 - 40

NOTES: 1. Values listed in table can be reduced to 33% by meeting Section 3 of ASHRAE Standard 62, but is no case less than 5 cfm/person.

2. Overall ventilation rate for the Hynes will be approximately 10 - 15% of the total air quantity listed in Table 6. 10% = 11.4 cfm/person for 12000 people.

VI. B. 3. Review Of Hynes Space and Function Program - HVAC:

1. Exhibit Hall:

"Use ASHRAE standards for loads. Consider use of electrostatic filters for smoke and particle removal, which can dramatically reduce fresh air requirements and corresponding air conditioning tonnage. Consider statification of air delivery in high spaces, to deliver conditioned air only at occupied levels. Establish velocities of air delivery which will not unduly disturb hanging banners or displays. Smoke removal system may be required by code and is desirable. Provide heaters over external service doors."

2. Lobbies:

"Normal. Use 15 sq. ft./person for loads."

3. Banquet/Ballrooms:

"Use about 1 person per 11 sq. ft. for population loads. Consider use of electrostatic filters for smoke and particle removal, which can be dramatically reduce fresh air requirements and corresponding air conditioning tonnage. Consider stratification of air delivery, to condition only at occupied levels."

4. Meeting Rooms:

"Use about 1 person per 11 square feet for population loads. Consider use of electrostatic filters for smoke and particle removal, which can dramatically reduce fresh air requirements and corresponding air conditioning tonnage. High delivery and low return recommended Exhaust interconnected to delivery system recommended."

5. Prefunction:

"Use about 1 person per 15 square feet for population load."

6. Building Control Room:

"Building Automation Computer."

THOMAS-YOUNG ASSOCIATES, INC.

ENERGY CONSERVATION ENGINEERS
617 MILL STREET — MARION, MASS. 02738
800-352-7166 617-748-0204

HYNES AUDITORIUM

BOSTON, MASSACHUSETTS

TESTING AND BALANCING

REPORT

JUNE 1982

Surveys. Audits. Performance Test. Improvements. Operation and Maintenance Procedures.
Testing and Balancing. Sound and Vibration Test and Analysis
Members — NSPE - ASHRAE - SAME - AABC

JOB: HYNES AUDITORIUM

THOMAS-YOUNG ASSOCIATES

ADDRESS: BOSTON, MASSACHUSETTS DATE: JUNE 1982

SUMMARY OF AIR HANDLING UNITS

UNIT NO.	SPECIFIED			ACTUAL		
	TOTAL CFM	RETURN CFM	OSA CFM	TOTAL CFM	RETURN CFM	OSA CFM
S-1	34365	27475	6890	22222	19228	2994
S-2	42820	20570	22250	22607	31302	0
S-3	45500	36400	9100	19027	31959	0
S-4	37760	21390	16370	23939	29520	0
S-5	45730	36580	9150	25163	17162	8001
S-6	45600	36460	9140	30262	32866	0
S-7	40810	31490	9320	21010	22094	0
S-8	34060	13150	20910	25544	26879	0
S-9	30860	0	30860	27183	14497	12686
S-10	33600	5100	28500	26110	18914	7196
S-11	23600	18880	4720	18472	14291	18472
S-12	17260	4040	13200	12678	14967	0
S-13	4310	940	3370	3951	2248	1703
TOTAL	436275	252495	183780	278168	275927	51052

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM BOSTON, MASSACHUSETTS

ADDRESS JUNE 17, 1982 DATE

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-1				R-1	
LOCATION	Penthouse				Penthouse	
MANUFACTURER	American Standard				American Standard	
MODEL NO.	66800C				*	
SERIAL NO.	274				*	
SIZE	330				*	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	34365	22222				19228
RETURN AIR C.F.M.	27475	19228				
O.S.A. C.F.M.	6890	2994				
TOTAL STATIC PRESSURE		5.92				1.97
SUCTION PRESSURE		-.82				-1.9"
DISCHARGE PRESSURE		+5.1				.07
MOTOR H.P.	75	75			25	25
VOLTAGE	480	480			480	480
PHASE	3	3			3	3
MOTOR RPM	1775	1775			1770	1770
FAN R.P.M.	NL	1400			NL	620
AMPERAGE	85	42/42/42			27.5	16/15/15

B.H.P.

*Nameplate not accessible - covered with insulation

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-1 BRANCH A SIZE 16" AREA 1.396 ACTUAL SP 3.4

TRAVERSE NO.	1	2	3	4	5	6
1	3500					
2	3000					
3	2900					
4	2900					
5	2800					
6	2600					
7						
8						
TOTAL	19800					
AVERAGE	3300					

AVERAGE VELOCITY = 3300 TOTAL CFM = 4597

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HINES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-1 BRANCH B-1 SIZE 16" AREA 1.396 ACTUAL SP ____

TRAVERSE NO.	1	2	3	4	5	6
1	2100					
2	1950					
3	1950					
4	1950					
5	2000					
6						
7						
8						
TOTAL	9950					
AVERAGE	1990					

AVERAGE VELOCITY = 1990 TOTAL CFM = 2778

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-1 BRANCH B-2 SIZE 18" AREA 1.767 ACTUAL SP ____

TRAVERSE NO.	1	2	3	4	5	6
1	2500					
2	2500					
3	2700					
4	2800					
5	2900					
6						
7						
8						
TOTAL	13400					
AVERAGE	2680					

AVERAGE VELOCITY = 2680 TOTAL CFM = 4736

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-1 BRANCH B-3 SIZE 22" AREA 2.64 ACTUAL SP ____

TRAVERSE NO.	1	2	3	4	5	6
1	1300					
2	1200					
3	1300					
4	1750					
5	1800					
6						
7						
8						
TOTAL	7350					
AVERAGE	1470					

AVERAGE VELOCITY = 1470 TOTAL CFM = 3881

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-1 BRANCH B-4 SIZE 22" AREA 2.64 ACTUAL SP 4.1

TRAVERSE NO.	1	2	3	4	5	6
1	2600					
2	2200					
3	2100					
4	2100					
5	2800					
6						
7						
8						
TOTAL	11800					
AVERAGE	2360					

AVERAGE VELOCITY = 2360 TOTAL CFM = 6230

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name AMES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM R1 BRANCH Main SIZE 86x30 AREA 17.92 ACTUAL SP -.27

TRAVERSE NO.	1	2	3	4	5	6
1	1200	1200	1300	1300	1300	1350
2	1100	1300	1400	1400	1500	1500
3	1100	1200	1300	1400	1400	1450
4	1000	1200	1200	1300	1400	1400
5	800	1100	1200	1300	1300	1250
6	500	700	1000	1050	1200	1200
7	500	500	700	800	800	900
8	400	500	600	600	700	700
TOTAL	6600	7700	8700	9150	9600	9750
AVERAGE	825	963	1088	1144	1200	1219

AVERAGE VELOCITY = 1073 TOTAL CFM = 19228

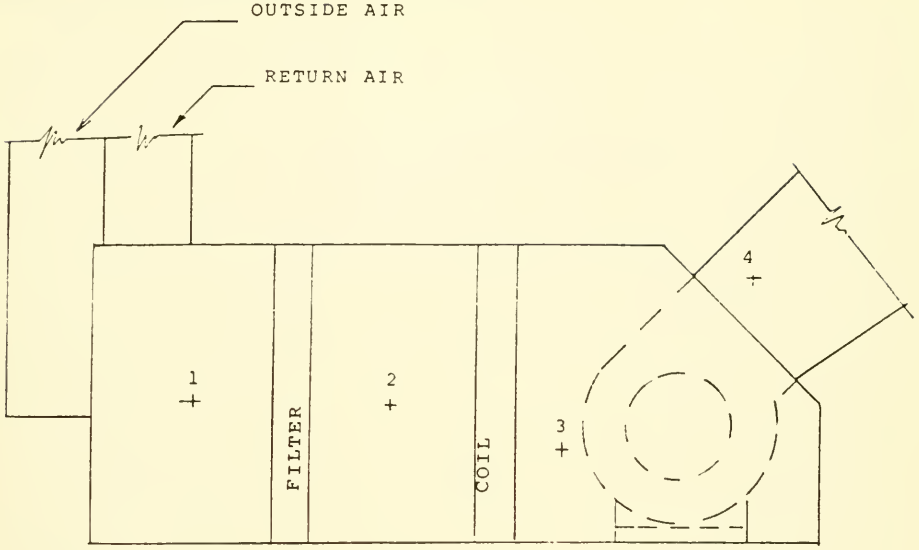
Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES



UNIT TRAVERSE READINGS

SUPPLY FAN NO. 1

SP-1 -0.48

SP-2 -0.59

SP-3 0.82

SP-4 5.92

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM

ADDRESS BOSTON, MASSACHUSETTS DATE JUNE 16, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-2				R-2	
LOCATION			Penthouse			
MANUFACTURER	American Standard				American Standard	
MODEL NO.	1-66800-D				NA	
SERIAL NO.	365-73				NA	
SIZE	365				NA	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	42820	~22607				31,302
RETURN AIR C.F.M.	20570	31302				
O.S.A. C.F.M.	22250	0				
TOTAL STATIC PRESSURE		6.8				2.45
SUCTION PRESSURE		-0.40				-2.40
DISCHARGE PRESSURE		6.40:				+0.05
MOTOR H.P.	75	75			30	30
VOLTAGE	480	480			480	480
PHASE	3	3			3	3
MOTOR RPM	1775	1775			1770	1770
FAN R.P.M.	NL	1340			NL	640
AMPERAGE	85	61/62/62			33	22/22/22

B.H.P.

Frame # 405U 326U

NOTE: Return is higher than supply air but supply is much less than design

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-2 BRANCH A-1 SIZE 22" AREA 2.64 ACTUAL SP 4.90"

TRAVERSE NO.	1	2	3	4	5	6
1	1600					
2	1500					
3	1450					
4	1350					
5	1400					
6	1450					
7	/					
8						
TOTAL	8750					
AVERAGE	1458					

AVERAGE VELOCITY = 1458 TOTAL CFM = 3849

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2}{(2)} + H" \times (W-H)$ / 144 = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HINES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-2 BRANCH A-2 SIZE 16" AREA 1.396 ACTUAL SP 5.95

TRAVERSE NO.	1	2	3	4	5	6
1	1500					
2	1300					
3	1300					
4	1300					
5	1300					
6	1500					
7						
8						
TOTAL	8200					
AVERAGE	1367					

AVERAGE VELOCITY = 1367 TOTAL CFM = 1908

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-2 BRANCH B-1 SIZE 16" AREA 1.396 ACTUAL SP 6.20

TRAVERSE NO.	1	2	3	4	5	6
1	1500					
2	1450					
3	1400					
4	1400					
5	1400					
6	1400					
7						
8						
TOTAL	8550					
AVERAGE	1425					

AVERAGE VELOCITY = 1425 TOTAL CFM = 1989

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2}{(2)} + H" \times (W-H)$ / 144 = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-2 BRANCH B-2 SIZE 22" AREA 2.64 ACTUAL SP 5.85"

TRAVERSE NO.	1	2	3	4	5	6
1	1600					
2	1550					
3	1500					
4	1400					
5	1350					
6	1350					
7						
8						
TOTAL	8750					
AVERAGE	~~1458~~					

AVERAGE VELOCITY = 1458 TOTAL CFM = 3849

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2}{(2)} + H" \times (W-H)$ / 144 = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HINES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-2 BRANCH C-1 SIZE 18" AREA 1.767 ACTUAL SP 1.75"

TRAVERSE NO.	1	2	3	4	5	6
1	2450					
2	2450					
3	2350					
4	2350					
5	2350					
6	1900					
7						
8						
TOTAL	13850					
AVERAGE	2308					

AVERAGE VELOCITY = 2308 TOTAL CFM = 4078

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-2 BRANCH C-2 SIZE 18" AREA 1.767 ACTUAL SP 5.60

TRAVERSE NO.	1	2	3	4	5	6
1	2300					
2	2200					
3	2200					
4	2300					
5	2300					
6	1400					
7						
8						
TOTAL	12700					
AVERAGE	2116					

AVERAGE VELOCITY = 2116 TOTAL CFM = 3739

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-2 BRANCH C-3 SIZE 18' AREA 1.767 ACTUAL SP 5.85"

TRAVERSE NO.	1	2	3	4	5	6
1	2050					
2	1950					
3	1900					
4	1800					
5	1600					
6	1550					
7						
8						
TOTAL	10850					
AVERAGE	1808					

AVERAGE VELOCITY = 1808 TOTAL CFM = 3195

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 22, 1982

DUCT TRAVERSE READINGS

SYSTEM R-2 BRANCH Main SIZE 80x40 AREA 22.2 ACTUAL SP 0.16

TRAVERSE NO.	1	2	3	4	5	6
1	800	1100	1400	1750	1900	1900
2	900	1000	1400	1700	1800	1950
3	900	1000	1450	1600	1800	1900
4	850	1100	1400	1600	1750	1900
5	900	1000	1400	1500	1750	1800
6						
7						
8						
TOTAL	4350	5200	7050	8150	8100	9450
AVERAGE	870	1040	1410	1630	1620	1890

AVERAGE VELOCITY = 1410 TOTAL CFM = 31302

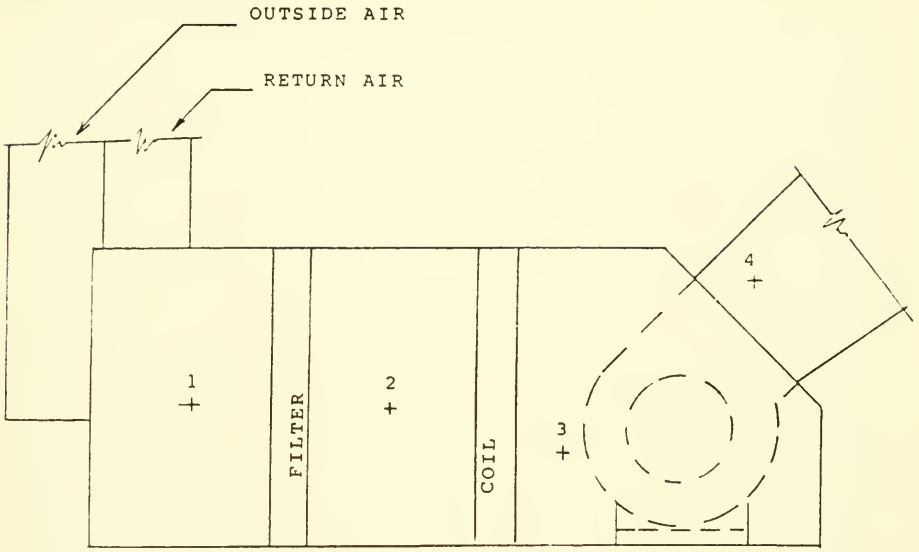
Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES



UNIT TRAVERSE READINGS

SUPPLY FAN NO. 2

SP-1	-0.23
SP-2	-0.26
SP-3	0.40
SP-4	6.40

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM BOSTON, MASSACHUSETTS

ADDRESS _____ DATE JUNE 16, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-3				R-3	
LOCATION			Penthouse			
MANUFACTURER	American Standard				American Standard	
MODEL NO.	1-66800-D				1-66800-1	
SERIAL NO.	365-73				542-10	
SIZE	365				542	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	45500	19027				31959
RETURN AIR C.F.M.	36400	31959				
O.S.A. C.F.M.	9100	0				
TOTAL STATIC PRESSURE		8.39				2.65
SUCTION PRESSURE		-0.49				-3.1
DISCHARGE PRESSURE		+7.9"				-0.45
MOTOR H.P.	75	75			30	30
VOLTAGE	480	480			480	480
PHASE	3	3			3	3
MOTOR RPM	1775	1775			1770	1770
FAN R.P.M.	NL	1380			NL	700
AMPERAGE	85	60/60/60			33	35/36/36

FRAME # 405U 326U

NOTE: Return is higher than supply. Supply is much less than design

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-3 BRANCH A-1 SIZE 22" AREA 2.640 ACTUAL SP 2.6

TRAVERSE NO.	1	2	3	4	5	6
1	2150					
2	1850					
3	1450					
4	1800					
5	1650					
6	1400					
7						
8						
TOTAL	10300					
AVERAGE	1717					

AVERAGE VELOCITY = 1717 TOTAL CFM = 4533

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2}{(2) \cdot 144} + H" \times (W-H)$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HINES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-3 BRANCH A-2 SIZE 22 AREA 2.64 ACTUAL SP 2.7

TRAVERSE NO.	1	2	3	4	5	6
1	1400					
2	1500					
3	1650					
4	1750					
5	1700					
6	1900					
7						
8						
TOTAL	9900					
AVERAGE	1650					

AVERAGE VELOCITY = 1650 TOTAL CFM = 4356

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-3 BRANCH A-3 SIZE 22" AREA 2.640 ACTUAL SP 3.6

TRAVERSE NO.	1	2	3	4	5	6
1	1400					
2	1400					
3	1600					
4	1650					
5	1700					
6	2000					
7						
8						
TOTAL	8720					
AVERAGE	1458					

AVERAGE VELOCITY = 1458 TOTAL CFM = 3849

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-3 BRANCH A-4 SIZE 22" AREA 2.640 ACTUAL SP +2.8

TRAVERSE NO.	1	2	3	4	5	6
1	2200					
2	1950					
3	1700					
4	1600					
5	1650					
6	1700					
7						
8						
TOTAL	10800					
AVERAGE	1800					

AVERAGE VELOCITY = 1800 TOTAL CFM = 4752

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-3 BRANCH B SIZE 14" AREA 1.069 ACTUAL SP +1.2

TRAVERSE NO.	1	2	3	4	5	6
1	1400					
2	1400					
3	1400					
4	1400					
5	1400					
6	1400					
7						
8						
TOTAL	8400					
AVERAGE	1400					

AVERAGE VELOCITY = 1400 TOTAL CFM = 1537

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 22, 1982

DUCT TRAVERSE READINGS

SYSTEM R-3 BRANCH Main SIZE134"x33" AREA 30.7ft^2 ACTUAL SP +0.07

TRAVERSE NO.	1	2	3	4	5	6	7
1	1100	1250	1200	1300	900	800	500
2	1300	1350	1300	1500	1000	700	500
3	1300	1500	1400	1550	1000	600	400
4	1300	1450	1400	1600	900	600	400
5	1250	1400	1200	1550	700	500	400
6	900	1300	1450	1500	500	600	400
7							
8							
TOTAL	7150	8250	7950	9000	5000	3800	2600
AVERAGE	1192	1375	1325	1500	833	633	433

AVERAGE VELOCITY = 1041 TOTAL CFM = 31959

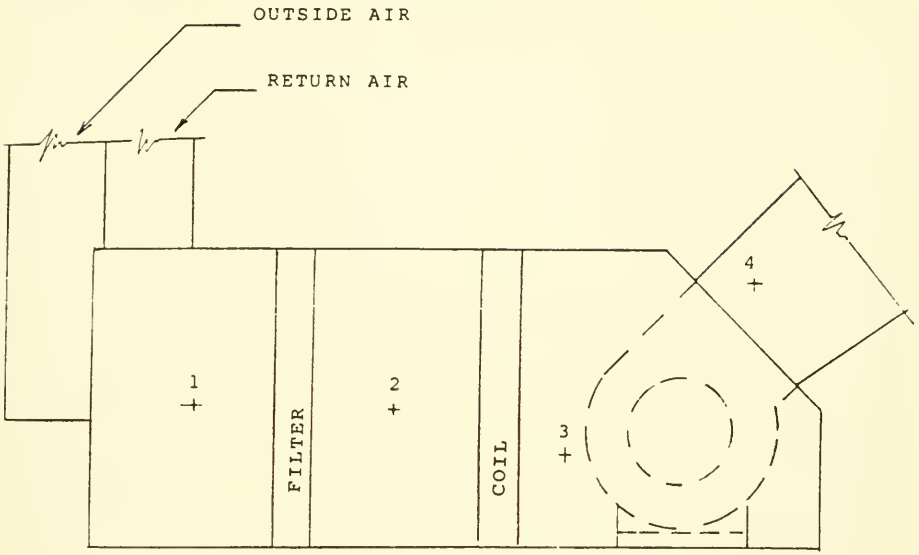
Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES



UNIT TRAVERSE READINGS

SUPPLY FAN NO. 3

SP-1 -0.22

SP-2 0.29

SP-3 0.49

SP-4 +7.9

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM

ADDRESS BOSTON, MASSACHUSETTS DATE JUNE 16, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-4				R-4	
LOCATION			Penthouse			
MANUFACTURER	American Standard				American Standard	
MODEL NO.	66800C				1-66800C	
SERIAL NO.	274				490-10	
SIZE	330				490	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	37760	23939				29520
RETURN AIR C.F.M.	21390	29520				
O.S.A. C.F.M.	16370	0				
TOTAL STATIC PRESSURE		6.50				1.82
SUCTION PRESSURE		-0.60				-2.10
DISCHARGE PRESSURE		+5.90				-.28
MOTOR H.P.	75	75			25	25
VOLTAGE	480	480			280	280
PHASE	3	3			3	3
MOTOR RPM	1775	1775			1770	1770
FAN R.P.M.	NL	1460			NL	620
AMPERAGE	85	45/45/45			27.5	19/18/18
B.H.P.						

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-4 BRANCH A-1 SIZE 18" AREA 1.767 ACTUAL SP 1.9"

TRAVERSE NO.	1	2	3	4	5	6
1	1900					
2	1600					
3	1300					
4	1200					
5	1300					
6	1300					
7						
8						
TOTAL	8600					
AVERAGE	1433					

AVERAGE VELOCITY = 1433 TOTAL CFM = 2532

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-4 BRANCH A2 SIZE 22" AREA 2.640 ACTUAL SP 3.6"

TRAVERSE NO.	1	2	3	4	5	6
1	2800					
2	2800					
3	2750					
4	2700					
5	2800					
6	2800					
7	2700					
8						
TOTAL	19350					
AVERAGE	2764					

AVERAGE VELOCITY = 2693 TOTAL CFM = 7297

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-4 BRANCH B-1 SIZE 22" AREA 2.64 ACTUAL SP +2.8

TRAVERSE NO.	1	2	3	4	5	6
1	3600					
2	3500					
3	3200					
4	2600					
5	2550					
6						
7						
8						
TOTAL	15450					
AVERAGE	3090					

AVERAGE VELOCITY = 3090 TOTAL CFM = 8158

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-4 BRANCH B-2 SIZE 22 AREA 2.64 ACTUAL SP 0.2"

TRAVERSE NO.	1	2	3	4	5	6
1	1500					
2	1500					
3	1500					
4	1500					
5	1550					
6	1550					
7	1550					
8	1550					
TOTAL	12200					
AVERAGE	1525					

AVERAGE VELOCITY = 1525 TOTAL CFM = 4026

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-4 BRANCH B-3 SIZE 10" AREA .545 ACTUAL SP 3.9

TRAVERSE NO.	1	2	3	4	5	6
1	1300					
2	1900					
3	2100					
4	2200					
5	2300					
6						
7						
8						
TOTAL	9800					
AVERAGE	1960					

AVERAGE VELOCITY = 1960 TOTAL CFM = 1070

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-4 BRANCH C SIZE 10" AREA .545 ACTUAL SP 4.8"

TRAVERSE NO.	1	2	3	4	5	6
1	1550					
2	1700					
3	1700					
4	1650					
5	1650					
6						
7						
8						
TOTAL	7850					
AVERAGE	1570					

AVERAGE VELOCITY = 1570 TOTAL CFM = 856

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 22, 1982

DUCT TRAVERSE READINGS

SYSTEM R-4 BRANCH MAIN SIZE 48x72 AREA 24ft^2 ACTUAL SP 0.32"

TRAVERSE NO.	1	2	3	4	5	6
1	1200	1300	200	1150		
2	1300	1200	1250	1200		
3	1300	1200	1250	1120		
4	1250	1300	1200	1200		
5	1300	1300	1200	1200		
6	1350	1200	1250	1150		
7	1250	1200	1250	1100		
8						
TOTAL	8950	8700	8600	8200		
AVERAGE	1278	1243	1228	1171		

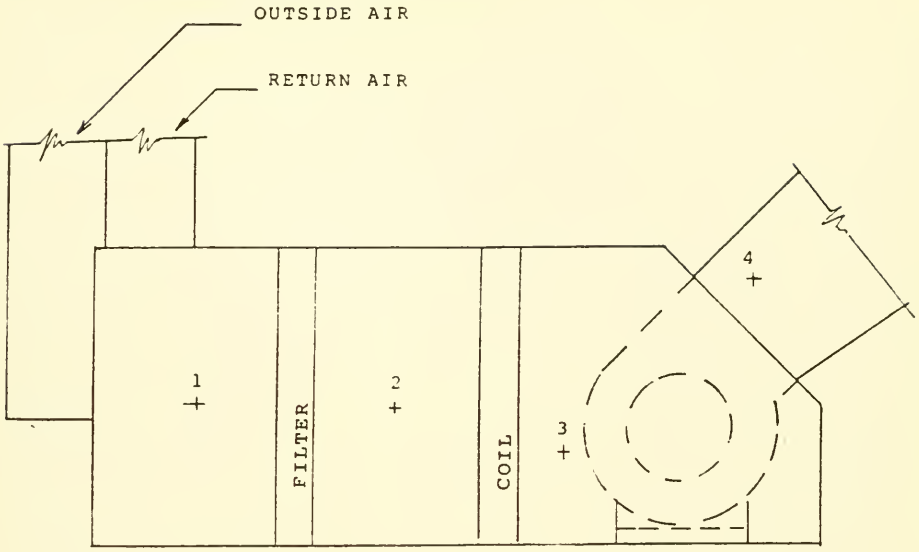
AVERAGE VELOCITY = 1230 TOTAL CFM = 29520

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2 + H" \times (W-H)}{(2) \quad 144}$ = Sq.Ft.



UNIT TRAVERSE READINGS

SUPPLY FAN NO. 4

SP-1 -.19

SP-2 .31

SP-3 0.60

SP-4 5.9

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM BOSTON, MASSACHUSETTS

X ADDRESS _____ DATE JUNE 15, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-5				R-5	
LOCATION			Penthouse			
MANUFACTURER	American Standard				American Standard	
MODEL NO.	1-66800-D				1-66800-1	
SERIAL NO.	365-73				542-10	
SIZE	365				542	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	45730	25163				17162
RETURN AIR C.F.M.	36580	17162				
O.S.A. C.F.M.	9150	8001				
TOTAL STATIC PRESSURE		4.24				1.73
SUCTION PRESSURE		-0.64				-1.65
DISCHARGE PRESSURE		3.60				+.08
MOTOR H.P.	75	75			30	30
VOLTAGE	480	480			480	480
PHASE	3	3			3	3
MOTOR RPM	1775	1775			1770	1770
FAN R.P.M.	NL	1220			NL	640
AMPERAGE	85	48/48/48			33	19/19/19
B.H.P.						

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM S-5 BRANCH A-1 SIZE 16" AREA 1.396 ACTUAL SP 3.7

TRAVERSE NO.	1	2	3	4	5	6
1	1650					
2	1700					
3	1800					
4	1800					
5	1800					
6	1750					
7						
8						
TOTAL	10500					
AVERAGE	1750					

AVERAGE VELOCITY = 1750 TOTAL CFM = 2443

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 15, 1982

DUCT TRAVERSE READINGS

SYSTEM S-5 BRANCH A-2 SIZE 18 AREA 1.767 ACTUAL SP 3.25

TRAVERSE NO.	1	2	3	4	5	6
1	2050					
2	2050					
3	2100					
4	2100					
5	2000					
6	1950					
7						
8						
TOTAL	12250					
AVERAGE	2042					

AVERAGE VELOCITY = 2042 TOTAL CFM = 3608

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 15, 1982

DUCT TRAVERSE READINGS

SYSTEM S-5 BRANCH B-1 SIZE 18" AREA 1.767 ACTUAL SP 3.3

TRAVERSE NO.	1	2	3	4	5	6
1	2600					
2	2600					
3	2600					
4	2500					
5	2400					
6	2400					
7						
8						
TOTAL	15100					
AVERAGE	2517					

AVERAGE VELOCITY = 2517 TOTAL CFM = 4448

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 15, 1982

DUCT TRAVERSE READINGS

SYSTEM S-5 BRANCH B-2 SIZE 18" AREA .767 ACTUAL SP 3.35

TRAVERSE NO.	1	2	3	4	5	6
1	2300					
2	2100					
3	2100					
4	1950					
5	1750					
6	1680					
7						
8						
TOTAL	11850					
AVERAGE	1975					

AVERAGE VELOCITY = 1975 TOTAL CFM = 3490

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 15, 1982

DUCT TRAVERSE READINGS

SYSTEM S-5 BRANCH B-3 SIZE 18" AREA 1.767 ACTUAL SP 3.2

TRAVERSE NO.	1	2	3	4	5	6
1	2000					
2	1900					
3	1900					
4	1750					
5	1700					
6	1700					
7						
8						
TOTAL	10950					
AVERAGE	1825					

AVERAGE VELOCITY = 1825 TOTAL CFM = 3225

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 15, 1982

DUCT TRAVERSE READINGS

SYSTEM S-5 BRANCH B-4 SIZE 20" AREA 2.182 ACTUAL SP 3.1

TRAVERSE NO.	1	2	3	4	5	6
1	2250					
2	2100					
3	2150					
4	2100					
5	2200					
6	2300					
7						
8						
TOTAL	13100					
AVERAGE	2183					

AVERAGE VELOCITY = 2183 TOTAL CFM = 4763

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 15, 1982

DUCT TRAVERSE READINGS

SYSTEM S-5 BRANCH B-5 SIZE 16" AREA 1.396 ACTUAL SP 3.4

TRAVERSE NO.	1	2	3	4	5	6
1	1550					
2	1250					
3	1200					
4	1300					
5	1400					
6	1300					
7						
8						
TOTAL	8000					
AVERAGE	1333					

AVERAGE VELOCITY = 1333 TOTAL CFM = 1861

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 15, 1982

DUCT TRAVERSE READINGS

SYSTEM S-5 BRANCH C SIZE 18" AREA 1.767 ACTUAL SP 1.3

TRAVERSE NO.	1	2	3	4	5	6
1	800					
2	900					
3	800					
4	700					
5	700					
6	600					
7						
8						
TOTAL	4500					
AVERAGE	750					

AVERAGE VELOCITY = 750 TOTAL CFM = 1325

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM R-5 BRANCH A SIZE 66x29 AREA 13.292 ACTUAL SP .53

TRAVERSE NO.	1	2	3	4	5	6
1	600					
2	400					
3	400					
4	400					
5	400					
6	400					
7	300					
8	300					
TOTAL	3200					
AVERAGE	400					

AVERAGE VELOCITY = 400 TOTAL CFM = 5317

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM R-5 BRANCH B SIZE 50x24 AREA 8.33 ACTUAL SP -0.81"

TRAVERSE NO.	1	2	3	4	5	6
1	800					
2	1100					
3	1100					
4	700					
5	500					
6	500					
7	750					
8	800					
TOTAL	6300					
AVERAGE	784					

AVERAGE VELOCITY = 784 TOTAL CFM = 6530

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM R-5 BRANCH C SIZE 25x49 AREA 8.507 ACTUAL SP -0.86"

TRAVERSE NO.	1	2	3	4	5	6
1	600					
2	600					
3	650					
4	600					
5	600					
6	700					
7	650					
8	600					
TOTAL	5000					
AVERAGE	625					

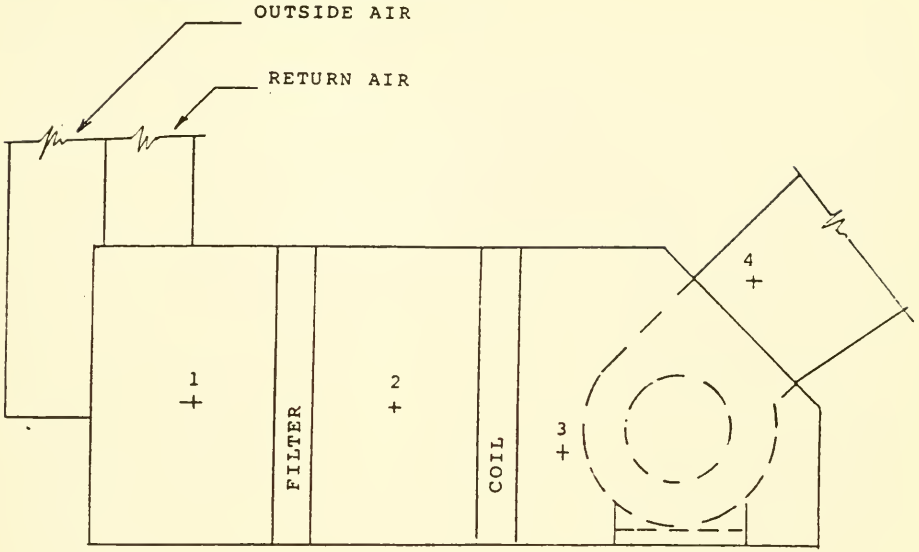
AVERAGE VELOCITY = 625 TOTAL CFM = 5315

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.



UNIT TRAVERSE READINGS

SUPPLY FAN NO. 5

SP-1 0.27

SP-2 -0.30

SP-3 -0.54

SP-4 3.6

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM

ADDRESS BOSTON, MASSACHUSETTS DATE JUNE 15, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-6				R-6	
LOCATION			Penthouse			
MANUFACTURER	American Standard				American Standard	
MODEL NO.	1-66800-D				1-66800-1	
SERIAL NO.	365-73				600-57	
SIZE	365				600	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	45600	32062			32866	
RETURN AIR C.F.M.	36460	32866				
O.S.A. C.F.M.	9140	0				
TOTAL STATIC PRESSURE		4.95				2.51
SUCTION PRESSURE		-0.65				-2.30
DISCHARGE PRESSURE		4.30				+0.21"
MOTOR H.P.	75	75			25	25
VOLTAGE	48	480			480	480
PHASE	3	3			3	3
MOTOR RPM	1775	1775			1770	1770
FAN R.P.M.	NL	1200			NL	540
AMPERAGE	85	45/46/46			27.5	23/22/22
B.H.P.						
FRAME #	405U				324U	

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-6 BRANCH A-1 SIZE 18" AREA 1.767 ACTUAL SP 3.6"

TRAVERSE NO.	1	2	3	4	5	6
1	3100					
2	3100					
3	2900					
4	2900					
5	3200					
6	3150					
7						
8						
TOTAL	18350					
AVERAGE	3058					

AVERAGE VELOCITY = 3058 TOTAL CFM = 5403

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-6 BRANCH A-2 SIZE 22" AREA 2.64 ACTUAL SP 3.9

TRAVERSE NO.	1	2	3	4	5	6
1	2400					
2	2350					
3	2300					
4	2200					
5	2150					
6	2250					
7	2400					
8	2600					
TOTAL	18650					
AVERAGE	2331					

AVERAGE VELOCITY = 2331 TOTAL CFM = 6154

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-6 BRANCH A-3 SIZE 16" AREA 1.40 ACTUAL SP 3.6"

TRAVERSE NO.	1	2	3	4	5	6
1	2750					
2	2800					
3	2850					
4	2800					
5	2800					
6	2800					
7	2800					
8	2800					
TOTAL	22400					
AVERAGE	2800					

AVERAGE VELOCITY = 2800 TOTAL CFM = 3920

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-6 BRANCH A-4 SIZE 16" AREA 1.40 ACTUAL SP 3.9

TRAVERSE NO.	1	2	3	4	5	6
1	2300					
2	2250					
3	2200					
4	2100					
5	2100					
6	2100					
7						
8						
TOTAL	13050					
AVERAGE	2175					

AVERAGE VELOCITY = 2175 TOTAL CFM = 3045

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-6 BRANCH A-5 SIZE 22" AREA 2.64 ACTUAL SP 3.3"

TRAVERSE NO.	1	2	3	4	5	6
1	2600					
2	2300					
3	2000					
4	1900					
5	2000					
6	2400					
7	2700					
8	2700					
TOTAL	18600					
AVERAGE	2325					

AVERAGE VELOCITY = 2325 TOTAL CFM = 6138

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-6 BRANCH A-6 SIZE 16" AREA 1.396 ACTUAL SP 4.3"

TRAVERSE NO.	1	2	3	4	5	6
1	1500					
2	1700					
3	1650					
4	1600					
5	1550					
6	1550					
7						
8						
TOTAL	9550					
AVERAGE	1592					

AVERAGE VELOCITY = 1592 TOTAL CFM = 2222

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-6 BRANCH A-7 SIZE 18" AREA 1.767 ACTUAL SP 4.25"

TRAVERSE NO.	1	2	3	4	5	6
1	1650					
2	1800					
3	1900					
4	1950					
5	2000					
6	2100					
7	2100					
8	1800					
TOTAL	15300					
AVERAGE	1913					

AVERAGE VELOCITY = 1913 TOTAL CFM = 3380

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

DUCT TRAVERSE READINGS

SYSTEM R-6 BRANCH Main SIZE 134x30 AREA 27.9 ACTUAL SP 0.14

TRAVERSE NO.	1	2	3	4	5	6
1	1750	1850	1900	2000	1500	1300
2	1750	1700	1500	1800	1100	1200
3	1700	1100	800	1100	500	1000
4	1500	600	500	600	500	800
5	1000	1500	700	500	800	800
6						
7						
8						
TOTAL	7700	6750	5400	6000	4400	5100
AVERAGE	1540	1350	1080	1200	880	1020

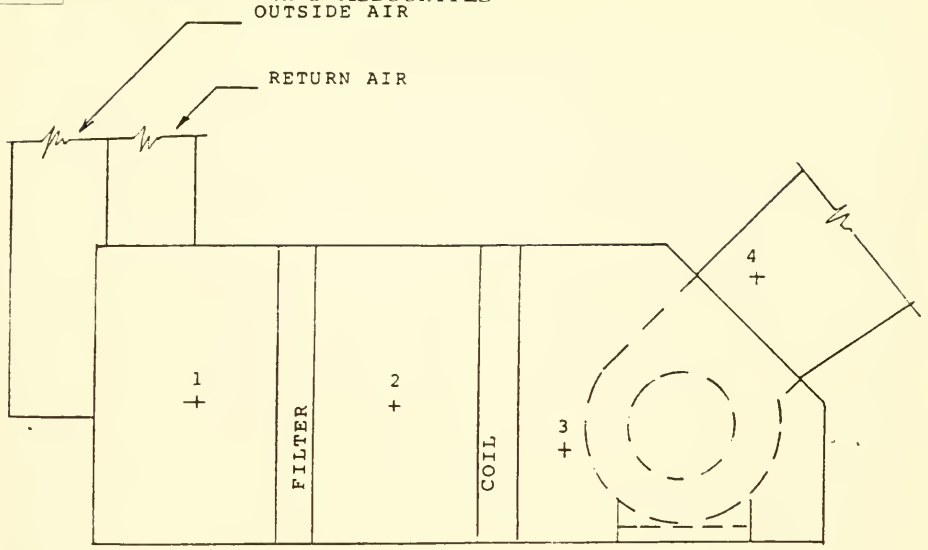
AVERAGE VELOCITY = 1178 TOTAL CFM = 32866

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.



UNIT TRAVERSE READINGS

SUPPLY FAN NO. 6

SP-1 -0.38

SP-2 0.35

SP-3 -0.65

SP-4 +4.30

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM BOSTON, MASSACHUSETTS

ADDRESS _____ DATE JUNE 16, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-7				R-7	
LOCATION			Penthouse			
MANUFACTURER	American Standard				American Standard	
MODEL NO.	1-66800-D				1-66800-K	
SERIAL NO.	365-73				402-19	
SIZE	365				402	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	40810	21010				22094
RETURN AIR C.F.M.	31490	22094				
O.S.A. C.F.M.	9320	0				
TOTAL STATIC PRESSURE		6.18				2.73
SUCTION PRESSURE		-0.38				-1.80"
DISCHARGE PRESSURE		5.80				+0.93
MOTOR H.P.	75	75			25	25
VOLTAGE	480	480			480	480
PHASE	3	3			3	
MOTOR RPM	1775	1775			1770	1770
FAN R.P.M.	NL	1250			NL	830
AMPERAGE	85	46/47/46			27.5	24/19/24
B.H.P.						

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS
HYNES AUDITORIUM

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-7 BRANCH A SIZE 18" AREA 1.767 ACTUAL SP 1.2"

TRAVERSE NO.	1	2	3	4	5	6
1	1900					
2	1900					
3	1850					
4	1850					
5	1900					
6	1950					
7						
8						
TOTAL	11350					
AVERAGE	1891					

AVERAGE VELOCITY = 1891 TOTAL CFM = 3341

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-7 BRANCH B-1 SIZE 22" AREA 2.64ft^2 ACTUAL SP 5.5

TRAVERSE NO.	1	2	3	4	5	6
1	1700					
2	1700					
3	1750					
4	1750					
5	1750					
6	1800					
7						
8						
TOTAL	10450					
AVERAGE	1742					

AVERAGE VELOCITY = 1742 TOTAL CFM = 4599

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-7 BRANCH B-2 SIZE 22" AREA 2.64 ft^2 ACTUAL SP 5.8

TRAVERSE NO.	1	2	3	4	5	6
1	1750					
2	1700					
3	1700					
4	1700					
5	1700					
6	1650					
7						
8						
TOTAL	10200					
AVERAGE	1700					

AVERAGE VELOCITY = 1700 TOTAL CFM = 4488

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-7 BRANCH B-3 SIZE 20" AREA .2.182 ACTUAL SP 5.8"

TRAVERSE NO.	1	2	3	4	5	6
1	1000					
2	1050					
3	1100					
4	1100					
5	1100					
6						
7						
8						
TOTAL	5350					
AVERAGE	1070					

AVERAGE VELOCITY = 1070 TOTAL CFM = 2335

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2 + H" \times (W-H)}{(2)\ 144}$ = Sq.Ft.

Job Name HYNES AUDITORIUM THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S^{-7} BRANCH B-4 SIZE 16" AREA 1.4ft^2 ACTUAL SP 5.15

TRAVERSE NO.	1	2	3	4	5	6
1	3000					
2	2900					
3	2800					
4	2850					
5	2850					
6						
7						
8						
TOTAL	14400					
AVERAGE	2880					

AVERAGE VELOCITY = 2880 TOTAL CFM = 4032

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2 + H" \times (W-H)}{(2)\ 144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 16, 1982

DUCT TRAVERSE READINGS

SYSTEM S-7 BRANCH C SIZE 12" AREA .78ft^2 ACTUAL SP 4.8

TRAVERSE NO.	1	2	3	4	5	6
1	2800					
2	2800					
3	2800					
4	2900					
5	2900					
6						
7						
8						
TOTAL	14200					
AVERAGE	2840					

AVERAGE VELOCITY = 2840 TOTAL CFM = 2215

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 22, 1982

DUCT TRAVERSE READINGS

SYSTEM R-7 BRANCH Main SIZE 78x36 AREA 19.5ft^2 ACTUAL SP -0.36

TRAVERSE NO.	1	2	3	4	5	6
1	900	900	1100	1100	1700	
2	900	900	1150	1200	1600	
3	800	900	1150	1250	1600	
4	800	900	1200	1200	1500	
5	1000	1000	1100	1100	1400	
6	1000	900	1300	1000	1450	
7						
8						
TOTAL	5400	5500	8000	6850	8250	
AVERAGE	900	917	1333	1142	1375	

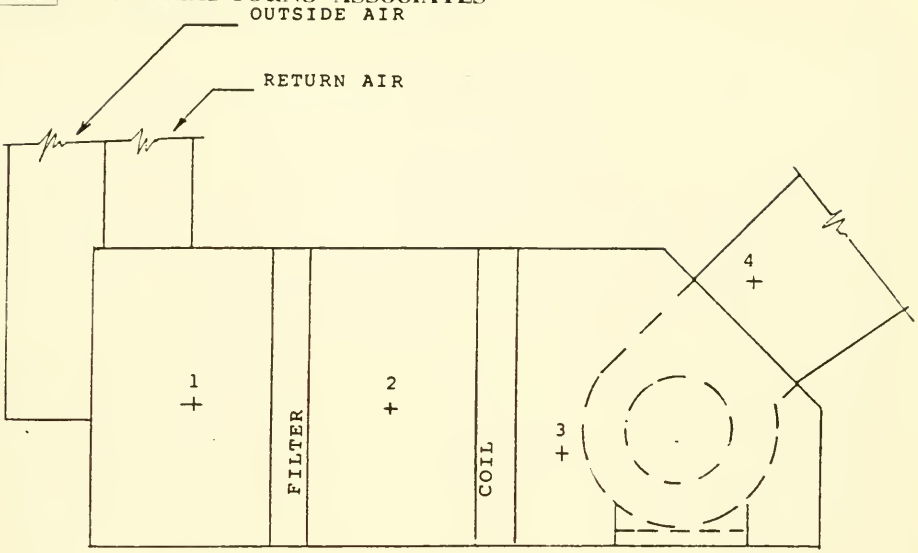
AVERAGE VELOCITY = 1133 TOTAL CFM = 22094

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.



UNIT TRAVERSE READINGS

SUPPLY FAN NO. 7

SP-1 -0.06

SP-2 -0.11

SP-3 -0.38

SP-4 5.8

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM

ADDRESS BOSTON, MASSACHUSETTS DATE JUNE 23, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-8				R-8	
LOCATION	Penthouse				Penthouse	
MANUFACTURER	American Standard				American Standard	
MODEL NO.	66800-E				*	
SERIAL NO.	445-89				*	
SIZE	445				*	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	34060	25544				26879
RETURN AIR C.F.M.	13150	26879				
O.S.A. C.F.M.	20910	0				
TOTAL STATIC PRESSURE		6.24				
SUCTION PRESSURE		-0.69				
DISCHARGE PRESSURE		5.55				
MOTOR H.P.	60	60			25	25
VOLTAGE	480	480			480	480
PHASE	3	3			3	3
MOTOR RPM	1775	1775			1770	1770
FAN R.P.M.	NL	1060			NL	740
AMPERAGE	70	44/44/44			27.5	16/15/15

B.H.P.

*Not Accessible

Job Name [illegible]

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-8 BRANCH A SIZE 14" AREA 1.07 ACTUAL SP 5.2"

TRAVERSE NO.	1	2	3	4	5	6
1	1850					
2	1900					
3	1800					
4	1750					
5	1700					
6	1700					
7						
8						
TOTAL	10700					
AVERAGE	1783					

AVERAGE VELOCITY = 1783 TOTAL CFM = 1908

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name [illegible] THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-8 BRANCH B1 SIZE 12 AREA 785 ACTUAL SP 4.5

TRAVERSE NO.	1	2	3	4	5	6
1	1300					
2	1300					
3	1300					
4	1300					
5	1350					
6	1400					
7						
8						
TOTAL	7950					
AVERAGE	1325					

AVERAGE VELOCITY = 1325 TOTAL CFM = 1040

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-8 BRANCH B2 SIZE 14" AREA 1.07 ACTUAL SP 4.00

TRAVERSE NO.	1	2	3	4	5	6
1	2800					
2	2700					
3	2650					
4	2650					
5	2700					
6	2700					
7						
8						
TOTAL	116200					
AVERAGE	2700					

AVERAGE VELOCITY = 2700 TOTAL CFM = 2889

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name [redacted] THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-8 BRANCH C1 SIZE 20" AREA 2.18 ACTUAL SP 4.3"

TRAVERSE NO.	1	2	3	4	5	6
1	2600					
2	2650					
3	2650					
4	2650					
5	2650					
6	2650					
7						
8						
TOTAL	15850					
AVERAGE	2642					

AVERAGE VELOCITY = 2642 TOTAL CFM = 5760

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-8 BRANCH C2 SIZE 20" AREA 2.18 ACTUAL SP 4.10"

TRAVERSE NO.	1	2	3	4	5	6
1	3100					
2	3150					
3	3150					
4	3050					
5	2950					
6	2800					
7						
8						
TOTAL	18200					
AVERAGE	3033					

AVERAGE VELOCITY = 3033 TOTAL CFM = 6612

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES — WINES AUDITORIUM — BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-8 BRANCH D SIZE 12 AREA .7854 ACTUAL SP 3.9"

TRAVERSE NO.	1	2	3	4	5	6
1	2700					
2	2750					
3	2850					
4	2900					
5	2850					
6	2850					
7						
8						
TOTAL	16900					
AVERAGE	2817					

AVERAGE VELOCITY = 2817 TOTAL CFM = 2212

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2 + H" \times (W-H)}{\frac{(2)}{144}}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-8 BRANCH E SIZE 20" AREA 2.18 ACTUAL SP 2.5

TRAVERSE NO.	1	2	3	4	5	6
1	2900					
2	2500					
3	2350					
4	2150					
5	2100					
6	2100					
7						
8						
TOTAL	14100					
AVERAGE	2350					

AVERAGE VELOCITY = 2350 TOTAL CFM = 5123

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2 + H" \times (W-H)}{(2)}$ / 144 = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM R-8 BRANCH 1 SIZE 23x34½" AREA 5.51 ACTUAL SP -0.61

TRAVERSE NO.	1	2	3	4	5	6
1	1300					
2	1300					
3	1300					
4	1300					
5	1250					
6	1300					
7	1200					
8	1100					
TOTAL	10050					
AVERAGE	1256					

AVERAGE VELOCITY = 1256 TOTAL CFM = 6920

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM R-8 BRANCH 2 SIZE 24x50 AREA 8.33 ACTUAL SP -0.65

TRAVERSE NO.	1	2	3	4	5	6
1	1200					
2	1200					
3	1100					
4	1400					
5	1500					
6	1200					
7	1000					
8						
TOTAL	8600					
AVERAGE	1229					

AVERAGE VELOCITY = 1229 TOTAL CFM = 10,237

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2}{(2)} + H" \times (W-H)$ / 144 = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM R-8 BRANCH 3 SIZE 22x46 AREA 7.03 ACTUAL SP -0.95

TRAVERSE NO.	1	2	3	4	5	6
1	600					
2	1500					
3	1750					
4	1600					
5	1400					
6	1450					
7						
8						
TOTAL	8300					
AVERAGE	1383					

AVERAGE VELOCITY = 1383 TOTAL CFM = 9722

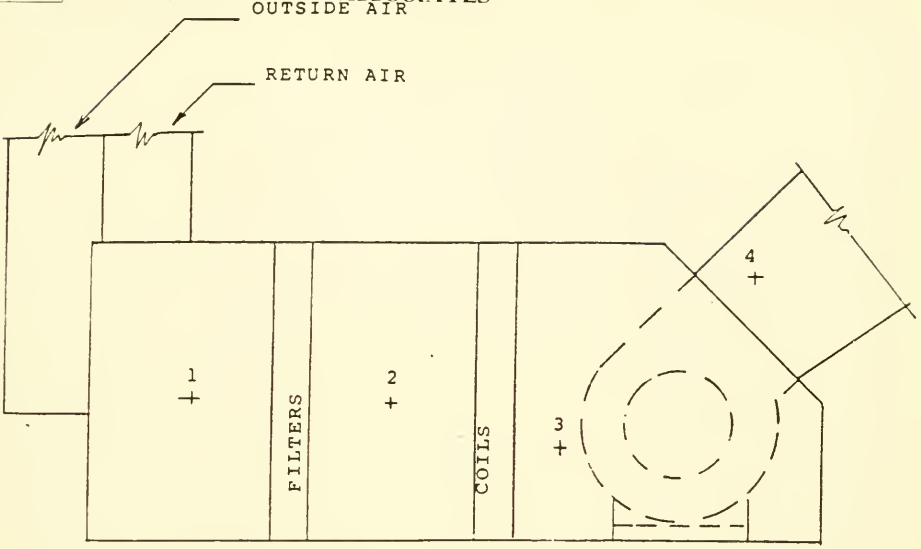
Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES



UNIT TRAVERSE READINGS

SUPPLY FAN NO. 8

SP-1	-0.2_4
SP-2	-0.42
SP-3	-0.69
SP-4	5.55

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM BOSTON, MASSACHUSETTS

ADDRESS _____ DATE JUNE 17, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-9				R-9	
LOCATION			Penthouse			
MANUFACTURER	American Standard				American Standard	
MODEL NO.	66800C				1-66800-H	
SERIAL NO.	274				490-10	
SIZE	330				490	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	30860	27183				14497
RETURN AIR C.F.M.	0	14497				
O.S.A. C.F.M.	30860	12686				
TOTAL STATIC PRESSURE		7.05				2.57
SUCTION PRESSURE		-0.95				-1.75"
DISCHARGE PRESSURE		+6.10"				+0.82"
MOTOR H.P.	60	60			20	20
VOLTAGE	480	480			480	480
PHASE	3	3			3	3
MOTOR RPM	1775	1775			1770	1770
FAN R.P.M.	NL	1480			NL	1250
AMPERAGE	0	46/46/46			23	19/19/19
B.H.P.						

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-9 BRANCH A SIZE 20" AREA 2.182 ACTUAL SP 3.6

TRAVERSE NO.	1	2	3	4	5	6
1	5000					
2	4300					
3	4200					
4	4000					
5	4100					
6	4200					
7						
8						
TOTAL	23800					
AVERAGE	3967					

TOTAL AVERAGE VELOCITY = 3967 TOTAL CFM = 8656

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-9 BRANCH B SIZE 20" AREA 2.182 ACTUAL SP 5.10"

TRAVERSE NO.	1	2	3	4	5	6
1	3100					
2	3100					
3	3100					
4	3200					
5	3200					
6	3300					
7						
8						
TOTAL	19000					
AVERAGE	3167					

TOTAL AVERAGE VELOCITY = 3167 TOTAL CFM = 6910

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name HYNES AUDITORIUM THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-9 BRANCH C SIZE 20: AREA 2.182 ACTUAL SP 4.15"

TRAVERSE NO.	1	2	3	4	5	6
1	3940					
2	3850					
3	3790					
4	3750					
5	3750					
6	3700					
7	3650					
8	3300					
TOTAL	29730					
AVERAGE	3716					

TOTAL AVERAGE VELOCITY = 3716 TOTAL CFM = 8108

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-9 BRANCH D SIZE 20 AREA 2.182 ACTUAL SP .93

TRAVERSE NO.	1	2	3	4	5	6
1	1550					
2	1600					
3	1500					
4	1600					
5	1700					
6	1700					
7						
8						
TOTAL	9650					
AVERAGE	1608					

TOTAL AVERAGE VELOCITY = 1608 TOTAL CFM = 3509

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM R-9 BRANCH A SIZE 30x22 AREA 4.58 ACTUAL SP +.45

TRAVERSE NO.	1	2	3	4	5	6
1	700					
2	700					
3	800					
4	800					
5	800					
6	800					
7	800					
8	800					
TOTAL	4600					
AVERAGE	767					

TOTAL AVERAGE VELOCITY = 767 TOTAL CFM = 3513

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 14, 1982

DUCT TRAVERSE READINGS

SYSTEM R-9 BRANCH B SIZE 38x16 AREA 4.22 ACTUAL SP .64

TRAVERSE NO.	1	2	3	4	5	6
1	1500					
2	1700					
3	1600					
4	1300					
5	1000					
6	800					
7						
8						
TOTAL	7900					
AVERAGE	1317					

AVERAGE VELOCITY = 1317 TOTAL CFM = 5558

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2}{(2)} + H" \times (W-H)$ / 144 = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM R-9 BRANCH C SIZE 23x24 AREA 3.83 ACTUAL SP -0.70"

TRAVERSE NO.	1	2	3	4	5	6
1	800					
2	850					
3	850					
4	900					
5	900					
6	850					
7	900					
8	1000					
TOTAL	7050					
AVERAGE	881					

AVERAGE VELOCITY = 881 TOTAL CFM = 3374

Formula for calculation area:

Rectangular Duct = $\frac{W'' \times H''}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2''}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H'')^2}{(2)} + H'' \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM R-9 BRANCH D SIZE 19x36 AREA 4.75 ACTUAL SP 1.4

TRAVERSE NO.	1	2	3	4	5	6
1	400					
2	400					
3	400					
4	400					
5	500					
6	500					
7						
8						
TOTAL	2600					
AVERAGE	433					

AVERAGE VELOCITY = 433 TOTAL CFM = 2052

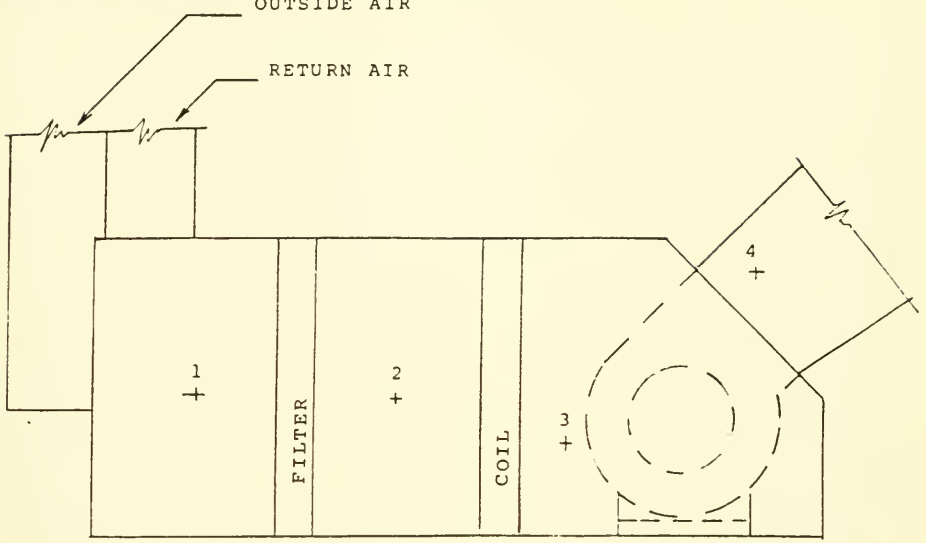
Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES



UNIT TRAVERSE READINGS

SUPPLY FAN NO. 9

SP-1 -0.45

SP-2 -0.58

SP-3 -.95

SP-4 6.10

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM BOSTON, MASSACHUSETTS

ADDRESS _____ DATE JUNE 17, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-10				R-10	
LOCATION			Penthouse			
MANUFACTURER	American Standard				American Standard	
MODEL NO.	66800C				1-66800-H	
SERIAL NO.	274				490-14	
SIZE	330				490	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	33600	26110				18914
RETURN AIR C.F.M.	5100	18914				
O.S.A. C.F.M.	285000	7196				
TOTAL STATIC PRESSURE		5.5				2.82
SUCTION PRESSURE		-1.3				-2.75"
DISCHARGE PRESSURE		4.2				+.07
MOTOR H.P.	60	60			25	25
VOLTAGE	480	480			480	480
PHASE	3	3			3	3
MOTOR RPM	1775	1775			1770	1770
FAN R.P.M.	NL	1390			NL	780
AMPERAGE	70	38/50/48			27.5	19/19/19
B.H.P.						
FRAME #	404U				324U	

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-10 BRANCH A SIZE 22" AREA 2.64 ACTUAL SP 2.6"

TRAVERSE NO.	1	2	3	4	5	6
1	3350					
2	2700					
3	2340					
4	2380					
5	2900					
6	3150					
7	3550					
8	3550					
TOTAL	23920					
AVERAGE	2990					

AVERAGE VELOCITY = 2990 TOTAL CFM = 7894

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name HAYES AUDITORIUM THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-10 BRANCH B SIZE 22" AREA 2.64 ACTUAL SP 2.15"

TRAVERSE NO.	1	2	3	4	5	6
1	3700					
2	3450					
3	3300					
4	3200					
5	3100					
6	3150					
7	3600					
8	3850					
TOTAL	27350					
AVERAGE	3419					

AVERAGE VELOCITY = 3419 TOTAL CFM = 9026

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-10 BRANCH C SIZE 22" AREA 2.64 ACTUAL SP 2.2"

TRAVERSE NO.	1	2	3	4	5	6
1	3450					
2	3350					
3	3250					
4	3300					
5	3450					
6	3550					
7	3650					
8	3850					
TOTAL	27850					
AVERAGE	3481					

TOTAL AVERAGE VELOCITY = 3481 TOTAL CFM = 9190

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2 + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM R-10 BRANCH Main SIZE 28x63 AREA 12.25ft^2 ACTUAL SP .58

TRAVERSE NO.	1	2	3	4	5	6
1	1200					
2	1300					
3	1800					
4	1600					
5	1300					
6	1350					
7	1750					
8	2050					
TOTAL	12350					
AVERAGE	1544					

AVERAGE VELOCITY = 1544 TOTAL CFM = 18914

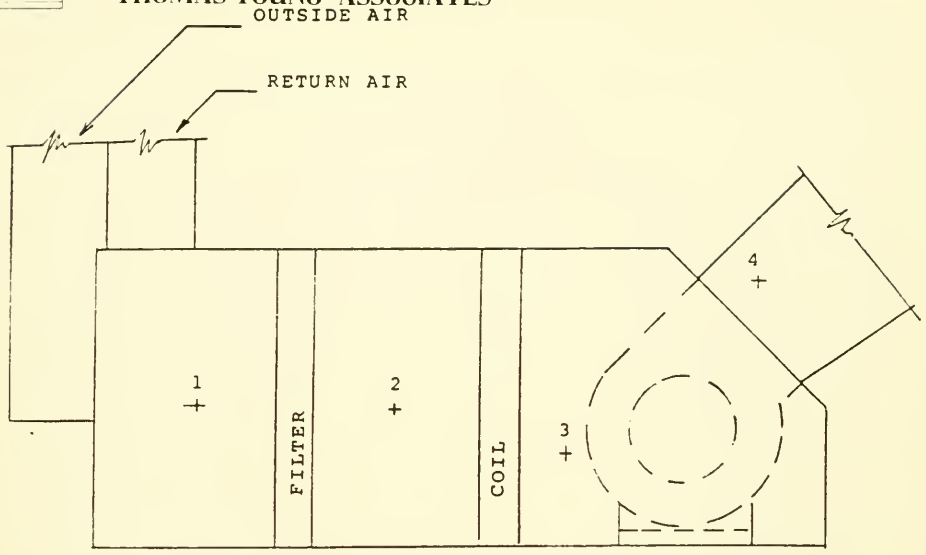
Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES



UNIT TRAVERSE READINGS

SUPPLY FAN NO. 10

SP-1 0.70

SP-2 -0.75

SP-3 -1.30

SP-4+ 4.2

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM

ADDRESS BOSTON, MASSACHUSETTS DATE JUNE 23, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-11			R-11	
LOCATION	Penthouse			Penthouse	
MANUFACTURER	American Standard			American Standard	
MODEL NO.	1-66800-F			1-66800-M	
SERIAL NO.	270=274			402-10	
SIZE	270			402	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	23600	18472				14291
RETURN AIR C.F.M.	18880	*0				
O.S.A. C.F.M.	4720	18472				
TOTAL STATIC PRESSURE		4.56				3.85
SUCTION PRESSURE		-0.66				-1.50:
DISCHARGE PRESSURE		3.9				+2.35
MOTOR H.P.	40	40			20	20
VOLTAGE	480	480			480	480
PHASE	3	3			3	3
MOTOR RPM	1770	1770			1770	1770
FAN R.P.M.	NL	1620			NL	960
AMPERAGE	46	28/26/27			23	20/19/20

B.H.P.

*NOTE: Return air damper to S-11 closed

Job Name THOMAS YOUNG ASSOCIATES — HYNES AUDITORIUM — BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-11 BRANCH A SIZE 20" AREA 2.182 ACTUAL SP 3.4

TRAVERSE NO.	1	2	3	4	5	6
1	2800					
2	2300					
3	1750					
4	1700					
5	2200					
6	3000					
7						
8						
TOTAL	13750					
AVERAGE	2292					

AVERAGE VELOCITY = 2292 TOTAL CFM = 5001

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-11 BRANCH B SIZE 20" AREA 2.182 ACTUAL SP 3.1"

TRAVERSE NO.	1	2	3	4	5	6
1	3000					
2	3450					
3	2300					
4	2150					
5	2500					
6	2650					
7						
8						
TOTAL	17050					
AVERAGE	2842					

AVERAGE VELOCITY = 2842 TOTAL CFM = 6201

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM S-11 BRANCH C SIZE 20" AREA 2.182 ACTUAL SP 2.85

TRAVERSE NO.	1	2	3	4	5	6
1	3150					
2	3250					
3	3300					
4	3300					
5	3400					
6	3600					
7						
8						
TOTAL	20000					
AVERAGE	3333					

AVERAGE VELOCITY = 3333 TOTAL CFM = 7270

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{(H")^2}{(2)} + H" \times (W-H)$ / 144 = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 22, 1982''

DUCT TRAVERSE READINGS

SYSTEM R-11 BRANCH Main SIZE 72x31 AREA 15.5 ACTUAL SP 2.45

TRAVERSE NO.	1	2	3	4	5	6
1	900	1050	950	1050	1000	700
2	1000	1000	1100	1100	900	600
3	1000	1000	1050	1150	1000	700
4	1000	900	1100	1200	1000	600
5	1000	900	1100	1200	1000	500
6	1000	800	1100	1200	900	400
7	900	700	1050	1200	900	400
8	900	700	1000	1000	800	400
TOTAL	7700	7050	8450	9100	7500	4300
AVERAGE	962	881	1056	1137	937	560

AVERAGE VELOCITY = 922 TOTAL CFM = 14291

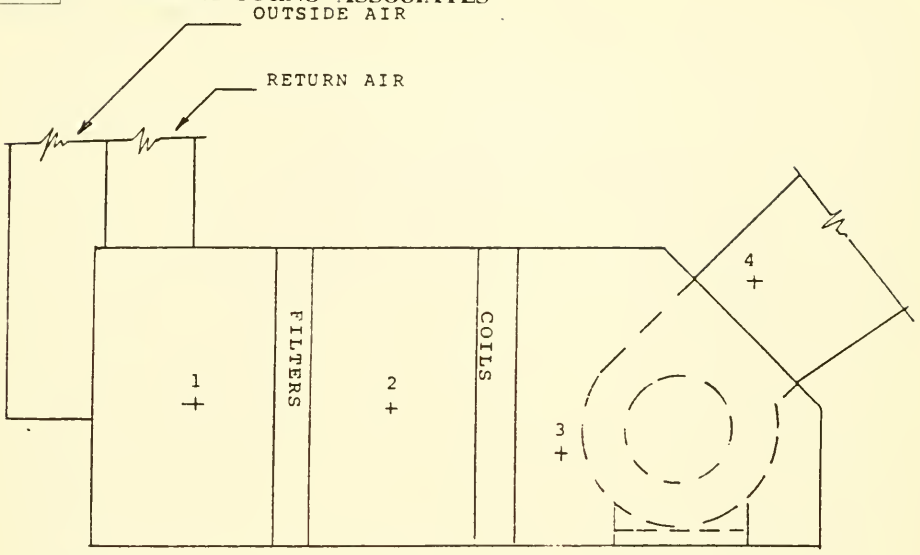
Formula for calculation area:

Rectangular Duct = $\frac{W'' \times H''}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2''}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H'')^2}{(2)} + H'' \times (W-H)}{144}$ = Sq.Ft.

NOTE: Return air damper to S-11 full closed



UNIT TRAVERSE READINGS

SUPPLY FAN NO. 11

SP-1 -0.34

SP-2 -0.41

SP-3 -0.66

SP-4 +3.9

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM BOSTON, MASSACHUETTS

ADDRESS _____ DATE _____

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-12				R-12	
LOCATION	Apparatus Room #4				Apparatus Room #4	
MANUFACTURER	American Standard				American Standard	
MODEL NO.	1-66800-G				1-66800-N	
SERIAL NO.	330-347				365-6	
SIZE	330				365	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	17260	12678				14,967
RETURN AIR C.F.M.	4040	14947				
O.S.A. C.F.M.	13200	0				
TOTAL STATIC PRESSURE		5.36				1.34
SUCTION PRESSURE		-0.41				-1.40"
DISCHARGE PRESSURE		4.95				-0.06
MOTOR H.P.	25	25			10	10
VOLTAGE	480	480			480	480
PHASE	3	3			3	3
MOTOR RPM	1770	1770			1760	1760
FAN R.P.M.	NL	1280			NL	800
AMPERAGE	27.5	19/18.5/18.5			12	8/7.5/7.5
B.H.P.						

THOMAS YOUNG ASSOCIATES

Job Name HAINES AUDITORIUM BOSTON, MASSACHUSETTS

Date

DUCT TRAVERSE READINGS

SYSTEM S-12 BRANCH A SIZE 22 AREA 2.64 ACTUAL SP 3.8

TRAVERSE NO.	1	2	3	4	5	6
1	1950					
2	2200					
3	2700					
4	2800					
5	2750					
6	2900					
7						
8						
TOTAL	15300					
AVERAGE	2550					

AVERAGE VELOCITY = 2550 TOTAL CFM = 6732

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date

DUCT TRAVERSE READINGS

SYSTEM S-12 BRANCH B SIZE 20 AREA 2.182 ACTUAL SP 3.7

TRAVERSE NO.	1	2	3	4	5	6
1	2600					
2	2550					
3	2550					
4	2850					
5	2850					
6	2650					
7	2850					
8	2900					
TOTAL	21800					
AVERAGE	2725					

AVERAGE VELOCITY = 2725 TOTAL CFM = 5946

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JUNE 28, 1982

DUCT TRAVERSE READINGS

SYSTEM R12 BRANCH Main SIZE 41x28 AREA 7.97ft^2 ACTUAL SP 0

TRAVERSE NO.	1	2	3	4	5	6
1	1600	1800	1800	2000		
2	1700	1950	2250	2200		
3	1700	2350	2400	2300		
4	1600	2300	2500	2500		
5	1500	2050	2300	2450		
6	1600	1750	1500	1200		
7	1700	1200	1600	800		
8						
TOTAL	11400	13400	14350	13450		
AVERAGE	1628	1914	2050	1921		

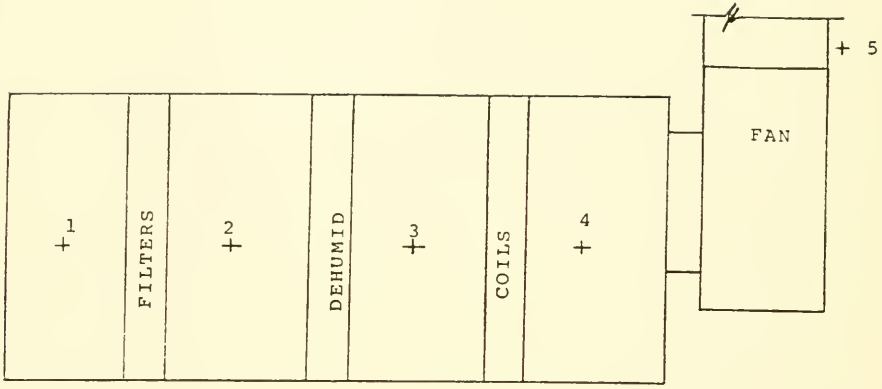
x AVERAGE VELOCITY = 1878 TOTAL CFM = 14967

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.



UNIT TRAVERSE READINGS

SUPPLY FAN S-12

SP-1 0.05

SP-2 -0.13

SP-3 -0.37

SP-4 -0.41

SP-5 +4.95

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM BOSTON, MASSACHUSETTS

ADDRESS _____ DATE JUNE 17, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	S-13			R-13	
LOCATION	Apparatus Room 4			Apparatus Room4	
MANUFACTURER	3-28323-16			*	
MODEL NO.	6-11-63			*	
SERIAL NO.				*	
SIZE	1AB15			*	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	4310	3951				2248
RETURN AIR C.F.M.	3370	2248				
O.S.A. C.F.M.	940	1703				
TOTAL STATIC PRESSURE		1.13				1.38
SUCTION PRESSURE		-0.20				-1.35
DISCHARGE PRESSURE		+0.93				0.03
MOTOR H.P.	5	5			2	2
VOLTAGE	480	480			480	480
PHASE	3	3			3	3
MOTOR RPM	1725	1725			1740	1740
FAN R.P.M.	NL	720			NL	1110
AMPERAGE	6	4/4/4			6/3	2/2.5/2.5

B.H.P.
*Not Accessible

Job Name THOMAS-YOUNG ASSOCIATES BOSTON, MASSACHUSETTS
HYNES AUDITORIUM

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM 13 BRANCH OA SIZE 30x16 AREA 3.3ft^2 ACTUAL SP -.13

TRAVERSE NO.	1	2	3	4	5	6
1	400	600	700	0	500	
2	0	500	750	400	600	
3	0	400	700	400	600	
4	400	500	700	600	700	
5	500	600	750	700	900	
6						
7						
8						
TOTAL	1300	2600	3600	2100	3300	
AVERAGE	260	520	720	420	660	

AVERAGE VELOCITY = 516 TOTAL CFM = 1,703

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name HINES AUDITORIUM THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JUNE 17, 1982

DUCT TRAVERSE READINGS

SYSTEM 13 BRANCH Return SIZE 12x24 AREA 2ft^2 ACTUAL SP -.09

TRAVERSE NO.	1	2	3	4	5	6
1	1250	800	1150	1500		
2	1000	800	1000	1600		
3	900	1000	1200	1150		
4	950	1300	1300	1100		
5						
6						
7						
8						
TOTAL	4100	3900	4650	5350		
q AVERAGE	1025	975	1163	1333		

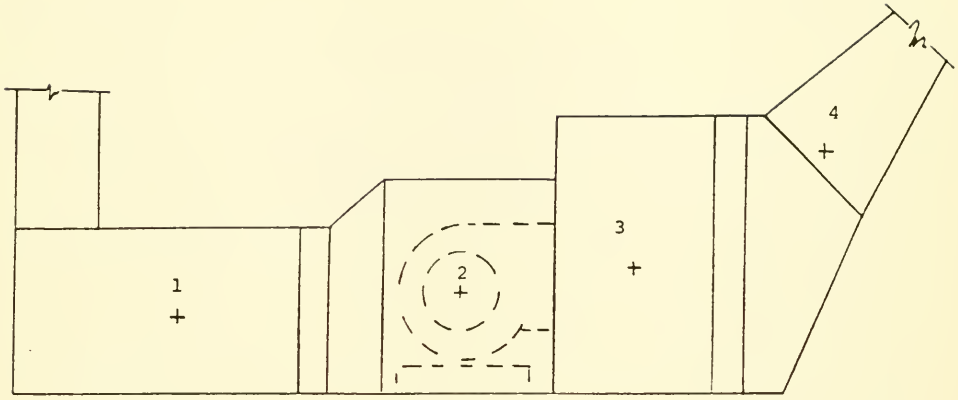
AVERAGE VELOCITY = 1124 TOTAL CFM = 2248

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.



UNIT TRAVERSE READINGS

SUPPLY FAN S-13

SP-1	-0.13
SP-2	-0.20
SP-3	+0.93
SP-4	+0.62

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM

Address BOSTON, MASSACHUSETTS Date JUNE 28, 1981

CIRCULATING WATER PUMP DATA

PUMP NO.	SERV	DESIGN GPM / TDH	ACTUAL PRESSURE SUCT. PSIG	ACTUAL PRESSURE DISC. PSIG	PD x 2.31= HD FT	AMPS DESIGN / ACTUAL	VOLT / PH	MOTOR RPM / HP	ACTUAL GPM / TDH	BHP
1	CW	1200 / 120	NR	NR	NR	67.8 / NR	480 / 3	NR / 60	NR / NR	
2	CW	1200 / 120	NR	NR	NR	67.8 / NR	480 / 3	NR / 60	NR / NR	
3	CW	2400 / 120	25	63	87.78	112.2 / 87	480 / 3	___ / 100	___ / 87.78	77
4	Tower Water Supply	3000 / 117	24	74	115.5	138.31 / 110	480 / 3	1 / 125	___ / 115.5	99
5	Tower Water Supply	1500 / 117	NR	NR	NR	67.8 / NR	480 / 3	NR / 60	NR / NR	
6	Tower Water Supply	1500 / 117	NR	NR	NR	67.8 / NR	480 / 3	NR / 60	NR / NR	
		___				___	___	___	___	
		___				___	___	___	___	
		___				___	___	___	___	
		___				___	___	___	___	

THOMAS YOUNG ASSOCIATES

JOB NAME HINES AUDITORIUM

ADDRESS BOSTON, MASS. DATE 6/30/82

DRIVE INFORMATION

UNIT	FAN		MOTOR		NO.	FAN	SHEAVE	C TO C
	PULLEY	BORE	PULLEY	BORE	BELTS	RPM	POSITION	DISTANCE
S-1	12"	2 15/16	11½	2½	6	1400	Full Open	56"
S-2	13½	2 15/16	11	2 7/8	7	1340	1/2 Open	56"
S-3	18½	2 13/16	14½	2 3/8	6	1380	Full Clsd	57"
S-4	11½	3	11	2 5/8	7	1460	Full Open	58"
S-5	13½	2 15/16	11	3	6	1220	Full Open	60
S-6	13½	2 13/16	11	2 7/8	6	1200	Full Open	57
S-7	14	2 15/16	10	2 7/8	7	1250	Full Open	60
S-8	15	3½	10	3	6	1060	Full Open	62
S-9	11	3 5/16	10	2 5/8	5	1480	1/2 Open	54"
S-10	12	2 15/16	11	2 3/8	6	1390	Full Open	57
S-11	10	2 7/16	12	2 3/8	4	1620	Full Open	48
S-12	11	2 5/16	9	1 3/8	4	1280	Full Open	55
S-13	9	1 5/16	7	1 1/8	2	720	1/2 Open	30

THOMAS YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM

ADDRESS BOSTON, MASS. DATE 6/30/82

DRIVE INFORMATION

UNIT	FAN		MOTOR		NO.	FAN	SHEAVE	C TO C
	PULLEY	BORE	PULLEY	BORE	BELTS	RPM	POSITION	DISTANCE
R-1	18½	2 3/16	6	2 1/8	4	620	Full Open	68
R-2	25	2 5/16	9½	3	4	640	1/2 Open	70
R-3	25	2 7/16	11	2 3/8	3	700	Full Open	73
R-4	18½	2 5/16	9	2 3/8	4	620	Full Open	67
R-5	25	2 3/16	9	2	4	640	Full Open	80
R-6	25	2 7/16	7	2 5/8	4	540	Full Clsd	70
R-7	15½	2 3/16	8	1 3/4	4	830	1/4 Open	56
R-8	18	2 3/16	7	2 1/8	4	740	Full Clsd	58
R-9	25	2 5/16	9½	1 7/8	3	1250	1/2 Open	72
R-10	19	2 5/16	9	2 3/8	4	780	Full Open	67
R-11	16	2 3/16	8½	1 5/8	3	960	Full Clsd	54
R-12	13½	1 13/16	7	1 1/4	2	800	1/2 Open	50
R-13	6½	1 3/16	5	5/8	1	1110	Full Open	28

THOMAS YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM

ADDRESS BOSTON, MASS. DATE 6/30/82

DRIVE INFORMATION

UNIT	FAN		MOTOR		NO. BELTS	FAN RPM	SHEAVE POSITION	C TO C DISTANCE
	PULLEY	BORE	PULLEY	BORE				
EX-1	15½	2	6	1½	2	640	Clsd	52
EX-2	16	2	5	1⅛	2	560	1/2 Open	57
EX-3	15	2 3/16	7	1⅛	2	560	Full Open	40
EX-4	13	1 3/16	5⅛	1	None	No Belt		24
EX-5	19	1 3/16	5½	7/8	1	256	Full Open	40
EX-6	19	1½	5½	1 3/8	1	175	1/2 Open	27½
EX-7	3½	15/16	3	1 1/8	1	Not Rng	Full Open	10½
EX-8	3	13/16	3	1	None	No Belt		10½
EX-9	3½	13/16	3	1 1/8	1	Not Rng	1/2 Open	10½
EX-10	3½	15/16	4	1 1/8	1	1420	Full Open	10½
EX-11	3½	15/16	4	1 3/8	1	1960	1/2 Open	9 3/4
EX-12	3½	15/16	4	1	None	No Belt		10
EX-14	4	1 1/8	3 3/4	1 1/8	1	1220	Full Open	13½
EX-14	13	1 13/16		1⅛	2	730	Full Open	55
EX-15	NOT TESTED				Window Prop			
EX-16	NOT TESTED				Window Prop			
EX-17	8½	1 3/8	4½	3/4	1	920	Closed	33
EX-18	3½	15/16	3½	1 3/8	1	Not Running	Full Clsd	9 3/4

JOB NAME HYNES AUDITORIUM

THOMAS-YOUNG ASSOCIATES

ADDRESS BOSTON, MASS. DATE 6/30/82

SUPPLY AIR FAN

TEMPERATURE INFORMATION

UNIT	SUPPLY AIR TEMP.	RETURN AIR TEMP.	MIXED AIR TEMP.	OUTSIDE AIR TEMP.
S-1	55.4	70.5	73.4	74
S-2	58	70.6	73.4	74
S-3	64.9	73.8	75.6	74
S-4	56.2	70.0	72.1	74
S-5	51.1	67	68.9	74
S-6	56.7	68.8	72.5	74
S-7	54.6	70.6	70.2	74
S-8	54.8	75.9	76.3	74
S-9	52.8	70.5	70.6	74
S-10	49.3	68.9	72.3	74
S-11	52.2	68.5	70.3	74
S-12	55	69.4	69.4	77.5
S-13	58	67	74	77.5

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM

Address BOSTON, MASSACHUSETTS Date JUNE 30, 1982

EXHAUST FAN TEST SHEET

FAN NO.	EX-1	EX-2	EX-3	EX-4	EX-5	EX-6	EX-7
MFG.	Am Std	Am Std	Am Std	Am Std	No Name	Am Std	No Name
SIZE	445	402		1L18	plate	2L20	plate
LOCATION	App 2	App 2	Food Concess. Storage	Gen Rm	Boiler Rm	Boiler Rm	Pent house
SAFETY FACTOR	1.15	1.15	1.15	1.15	1.25	1.15	No Name-plate
VOLT./ PH	480/3	480/3	480/3	480/3	220/480 3	480/3	
AMP RATING	9.2	6.4	1.2	3.85	3.6/1.8	6.0	
ACTUAL AMPS	8.0/8.0 8.0	4.0/4.0 4.0	7.5/6.5 6.5	2.4/2.3 2.4	1/1/ 1	1.5/1.5 1.5	Not Running
DESIGN RPM (FAN)	---	---	---	---	---	---	---
ACTUAL RPM (FAN)	640	560	560	No	256	175	---
SHEAVE POSITION	Clsd	1/2 Open	Full Open	Belts	Full Open	Open	Full Open
REQUIRED CFM	See Dwgs.	See Dwgs.	See Dwgs.	See Dwgs	See Dwgs	See Dwgs	See Dwgs
ACTUAL CFM	14,000	12,788	12,160	1	2091	No access to ducts	Not Running
H.P.	7.5	5	10	3	1	5	
DESIGN SP	---	---	---	---	---	---	---
ACTUAL SP	2.31	1.73	1.18	Not	1.01	.07	NR
SUCTION SP	2.10"	-1.3	-0.75	On	-0.61	.01	NR
DISC. SP.	.21"	+0.43	-0.43	1	0.40	.06	NR

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM

Address BOSTON, MASSACHUSETTS Date JUNE 30, 1982

EXHAUST FAN TEST SHEET

FAN NO.	EX-8	EX-9	EX-10	EX-11	EX-12	EX-13	EX-14
MFG.	Am Std	Am Std	Am Std	Am Std	No Nmplt	Am Std	Am Std
SIZE	122	122B5	122	135		165EW	165
LOCATION	Pent house	Pent house	Pent house	Pent house	Pent house	Pent house	Pent house
SAFETY FACTOR	No Nmplt	1.35	1.0	1.25	No Nmplt	No Nmplt	NL
VOLT./ PH	Needs Belt	115/1	440/3	440/3	"	"	480/3
AMP RATING	Not Running	4.4	1.9/.95	2.6/1.3	"	"	6.4
ACTUAL AMPS	"	NR	1.0/1.0 1.0	1.4/1.3 1.2	"	1.8/1.8 1.7	4.6/4.6 4.4
DESIGN RPM (FAN)	"	NR	---	---	NL	---	---
ACTUAL RPM (FAN)	"	NR	1420	1900	NR	1400	1720
SHEAVE POSITION	"	1/2	Open	Clsd		Open	Open
REQUIRED CFM	"						
ACTUAL CFM	"		692	1300	No Belt	2640	4576
H.P.	"		1/2	3/4	"		5
DESIGN SP	"		NL	NL	NL	NL	NL
ACTUAL SP	"		.73	2.23		1.33	2.44
SUCTION SP.			-.63	-2.0		-1.1	-2.4
DISC. SP.			+.10	.23		.23	.04

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM

Address BOSTON, MASSACHUSETTS Date JUNE 30, 1982

EXHAUST FAN TEST SHEET

FAN NO.	EX-15	EX-16	EX-17	EX-18			
MFG.	Am Std	Am Std	Am Std	Am Std			
SIZE	24CT	24CT	245	122B5			
LOCATION	Pent house	Pent house	APP 2	Pent house			
SAFETY FACTOR			1.20	NL			
VOLT./ PH 1			208/220 480/3	115/230 1			
AMP RATING	TESTED	TESTED	5/2.5	5.2/2.6			
ACTUAL AMPS			2.4/2.4 2.4	WE			
DESIGN RPM (FAN)			920	COULD			
ACTUAL RPM (FAN)			Open	NOT			
SHEAVE POSITION	NOT	NOT		OPERATE			
REQUIRED CFM				THIS			
ACTUAL CFM	Window Prop	Window Prop	4054	UNIT			
H.P.			1 1/2				
DESIGN SP			~~1-6~~ NOT				
ACTUAL SP			1.62				
SUCTION SP.			-0.32				
DISC. SP.			+1.3"				

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM

Address BOSTON, MASSACHUSETTS Date JULY 1, 1982

EXHAUST FAN TEST SHEET

FAN NO.	V-1	V-2	V-3	V-4	V-5	V-6	V-7
MFG.	Am Std	Am Std	Am Std	There	Am Std	Am Std	Am Std
SIZE	NA	NA	NA	is	1L15	NA	1V9
LOCATION	Basement Shop	Basement Shop	Base. Shop	No	Trucking Area	Trucking Area	Pent house
SAFETY FACTOR	1.15	1.15	1.15	V-4	1.25	1.15	1.25
VOLT./ PH	480/3	480/3	480/3		220/440 3	480/3	440/3
AMP RATING	9.2	9.2	9.2		3.4/1.7	9.2	1.9/.95
ACTUAL AMPS	4.6/4.8 4.8	4.6/4.2 4.4	3.6/3.4 3.4		1.0/1.0 1.2	3.8/4.0 3.8	.5/.5 .8
DESIGN RPM (FAN)	---	---	---		---	NL	---
ACTUAL RPM (FAN)	650	NA	NA		650	620	1100
SHEAVE POSITION	Full Open	80% Open	80% Open		Full Open	7/8 Clsd.	1/2
REQUIRED CFM	---	---	---		---	NL	---
ACTUAL CFM	19153	14644	15000		2910	9190	549
H.P.	7.5	7.5	7.5		1	7.5	1/2
DESIGN SP	NL	NL	NL	---	NL	NL	NL
ACTUAL SP	0.62	0.90	0.64		0.14	0.64	0.40
SUCTION SP.	-0.42	-0.45	-0.05		-0.13	-0.41	-.02
DISC. SP.	0.2	0.45	0.59		.01	0.23	.38

THOMAS-YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM

Address BOSTON, MASSACHUSETTS Date JULY 1, 1982

EXHAUST FAN TEST SHEET

FAN NO.	V-8	V-9					
MFG.	Am Std	Am Std					
SIZE	1V9	1V9					
LOCATION	Pent house	Pent house					
SAFETY FACTOR	1.25	1.25					
VOLT./ PH	440/3	440/3					
AMP RATING	No Nmplt	1.9/.95					
ACTUAL AMPS	.8/.8 .5	.5/.5 .5					
DESIGN RPM (FAN)	---	---					
ACTUAL RPM (FAN)	322	346					
SHEAVE POSITION	Open	Open					
REQUIRED CFM	Check Dwgs.	Check Dwgs.					
ACTUAL CFM	656	847					
H.P.	1/2	1/2					
DESIGN SP	NL	NL					
ACTUAL SP	.07	.08					
SUCTION SP.	.07	.05					
DISC. SP.	0.00	.03					

THOMAS YOUNG ASSOCIATES

Job Name MINES AUDITORIUM BOSTON, MASSACHUSETTS

Date JULY 1, 1982

DUCT TRAVERSE READINGS

SYSTEM E-1 BRANCH Main SIZE 45x40 AREA 1.25 ACTUAL SP +0.44"

TRAVERSE NO.	1	2	3	4	5	6
1	1200	1300	1150	800		
2	1200	1250	900	800		
3	1200	1250	900	850		
4	1200	1250	900	950		
5	1200	1250	1000	1000		
6	1300	1300	1050	1050		
7	1300	1300	1100	1050		
8	1350	1300	1150	1050		
TOTAL	9950	10200	8150	7550		
AVERAGE	1244	1275	1019	944		

AVERAGE VELOCITY = 1120 TOTAL CFM = 14000

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name HARVARD AUDITORIUM

Date JULY 1, 1982

DUCT TRAVERSE READINGS

SYSTEM E-2 BRANCH _____ SIZE 50x36 AREA 12.5 ACTUAL SP -1.3

TRAVERSE NO.	1	2	3	4	5	6
1	1100	1050	1150	1500	1100	
2	1100	1100	1100	1150	1000	
3	1100	1050	1050	1200	1000	
4	1100	1000	900	1000	1000	
5	1000	900	800	1000	900	
6	1000	800	800	850	900	
7						
8						
TOTAL	6400	5900	5800	6700	5900	
AVERAGE	1067	983	967	1117	983	

AVERAGE VELOCITY = 1023 TOTAL CFM = 12788

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JULY 2, 1982

DUCT TRAVERSE READINGS

SYSTEM E-3 BRANCH Disch. SIZE 80x23 AREA 12.8 ACTUAL SP +.43

TRAVERSE NO.	1	2	3	4	5	6
1	1050	900	1000	00	800	
2	1000	900	1000	900	900	
3	1100	900	1000	900	900	
4	1000	900	1000	950	900	
5	1000	900	1000	950	900	
6	1000	900	1000	950	950	
7	1000	900	1000	950	950	
8						
TOTAL	7150	6300	7000	6500	6300	
AVERAGE	1021	900	1000	929	900	

AVERAGE VELOCITY = 950 TOTAL CFM = 12160

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HINES AUDITORIUM BOSTON, MASSACHUSETTS

Date JULY 1, 1982

DUCT TRAVERSE READINGS

SYSTEM EX-5 BRANCH ____ SIZE 38x14 AREA 3.7ft^2 ACTUAL SP +0.40

TRAVERSE NO.	1	2	3	4	5	6
1	600	500	600	600	600	
2	600	500	600	500	700	
3	600	500	500	500	650	
4	600	500	500	500	650	
5						
6						
7						
8						
TOTAL						
AVERAGE	600	500	550	525	650	

AVERAGE VELOCITY = 565 TOTAL CFM = 2091

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HINES AUDITORIUM BOSTON, MASSACHUETTS

Date JULY 1, 1982

DUCT TRAVERSE READINGS

SYSTEM E-17 BRANCH _____ SIZE 26½x19½ AREA 3.59 ACTUAL SP +1.45

TRAVERSE NO.	1	2	3	4	5	6
1	900	1100	1300	1300	1400	
2	1000	1100	1250	1300	1400	
3	1000	1000	1200	1200	1300	
4	1000	1000	1200	1000	1200	
5	000	1000	1200	700	1100	
6						
7						
8						
TOTAL						
AVERAGE	980	1040	1230	1100	1280	

AVERAGE VELOCITY = 1126 TOTAL CFM = 4054

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

JOB NAME THOMAS YOUNG ASSOCIATES

ADDRESS BOSTON, MASS. DATE 6/30/82

DRIVE INFORMATION

UNIT	FAN		MOTOR		NO. BELTS	FAN RPM	SHEAVE POSITION	C TO C DISTANCE
	PULLEY	BORE	PULLEY	BORE				
V-1	13"	1 3/16	5 1/4	7/8	1	650	Full Open	20"
V-2	27"	2 5/16	8"	1 3/8	2	NA	80% Open	32"
V-3	27"	2 5/16	8"	1 3/8	2	NA	80% Open	32"
V-4		No V-4						
V-5	18"	1 5/8	6 1/2	1 5/8	2	640	7/8 Clsd	29"
V-6	16"	1 9/16	6"	1 5/8"	2	620	7/8 Clsd	30"
V-7	7"	1 3/16	5"	7/8"	1	1100	1/2 Open	12"
V-8	5½"	1 3/16	5"	NA	1	322	Full Open	22½"
V-9	7"	1 13/16	5"	7/8"	1	346	Full Open	12"

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JULY 1, 1982

DUCT TRAVERSE READINGS

SYSTEM V-1 BRANCH _____ SIZE 18x23 AREA 17.9ft^2 ACTUAL SP 0.45

TRAVERSE NO.	1	2	3	4	5	6
1	1500	1600	1200	700	500	
2	1500	1700	1100	700	500	
3	1600	1700	1000	700	500	
4	1500	1500	1000	700	500	
5	1500	1400	1000	800	500	
6	1500	1400	1100	700	500	
7	550	1800				
8						
TOTAL	10650	10800	6400	4300	3000	
AVERAGE	1521	1543	1067	717	500	

AVERAGE VELOCITY = 1070 TOTAL CFM = 19153

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JULY 1, 1982

DUCT TRAVERSE READINGS

SYSTEM V-2 BRANCH Discharge SIZE 65x26 AREA 11.8ft^2 ACTUAL SP +0.2

TRAVERSE NO.	1	2	3	4	5	6
1	1150	1200	1150	1100	1000	
2	1050	1200	1200	1200	1150	
3	1100	1200	1300	1250	1200	
4	1200	1200	1300	1300	1250	
5	1250	1200	1300	1300	1200	
6	1200	1150	1250	1300	1200	
7	1200	1100	1200	1300	1200	
8				1200	1200	
TOTAL	8150	8250	8700	9950	9400	
AVERAGE	1164	1178	1443	1244	1175	

AVERAGE VELOCITY = 1241 TOTAL CFM = 14644

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JULY 1, 1982

DUCT TRAVERSE READINGS

SYSTEM V-3 BRANCH Suction SIZE 72x40 AREA 20ft^2 ACTUAL SP -0.05

TRAVERSE NO.	1	2	3	4	5	6
1	600	800	700	800	600	
2	700	900	700	900	600	
3	600	800	750	800	700	
4	700	900	700	850	700	
5	800	800	800	800	700	
6	700	800	750	850	700	
7						
8						
TOTAL	4100	5000	4400	5000	4000	
AVERAGE	683	833	733	833	667	

AVERAGE VELOCITY = 750 TOTAL CFM = 15000

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HYNES AUDITORIUM BOSTON, MASSACHUSETTS

Date JULY 1, 1982

DUCT TRAVERSE READINGS

SYSTEM V-5 BRANCH _____ SIZE 14x40 AREA 3.88 ACTUAL SP -0.13

TRAVERSE NO.	1	2	3	4	5	6
1	700					
2	800					
3	800					
4	700					
5	700					
6	800					
7	750					
8						
TOTAL						
AVERAGE						

AVERAGE VELOCITY = 750 TOTAL CFM = 2910

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS YOUNG ASSOCIATES

Job Name HINES AUDITORIUM BOSTON, MASSACHUSETTS

Date JULY 1, 1982

DUCT TRAVERSE READINGS

SYSTEM V-6 BRANCH ____ SIZE 24x60 AREA 10ft^2 ACTUAL SP +0.23

TRAVERSE NO.	1	2	3	4	5	6
1	1100	1000	800			
2	1100	1000	800			
3	1150	900	900			
4	1100	1100	900			
5	1050	1000	900			
6	1000	1000	800			
7	800	800	700			
8						
TOTAL	7400	6800	5800			
AVERAGE	1057	971	729			

AVERAGE VELOCITY = 919 TOTAL CFM = 9190

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM

ADDRESS BOSTON, MASS. DATE 6/30/82

DRIVE INFORMATION

UNIT	FAN		MOTOR		NO. BELTS	FAN RPM	SHEAVE POSITION	C TO C DISTANCE
	PULLEY	BORE	PULLEY	BORE				
WCV-1	---	No Belts			Not Rng			Enclosed Direct Drive
2	No Access							
3	Direct Drive							
4	4½	1 3/16	4	1½	None			14
5	6	11/16	6	1 1/8	1	1560	1/2 Open	26
6	5½	1 3/16	4	1 1/8	1	1080	Full Open	13 3/4
7	Not Running (Enclosed Unit)							

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM

ADDRESS BOSTON, MASSACHUSETTS DATE JULY 1, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	WCV-1		WCV-2		WCV-3	
LOCATION	Service Opening to Hotel		Column I-150 Basement		Boiler Room	
MANUFACTURER	Am Std		Opp Elevator Col 15D-I		Am Std	
MODEL NO.	10SHR					
SERIAL NO.	NA					
SIZE					75M	
OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.	Needs			NO	NL	963
RETURN AIR C.F.M.	Belt			A	NL	963
O.S.A. C.F.M.				C	NL	0
TOTAL STATIC PRESSURE				C	NL	0.34
SUCTION PRESSURE				E	NL	-0.03
DISCHARGE PRESSURE		Not		S	NL	0.31
MOTOR H.P.	1/4	Running		S	NL	1/6 -
VOLTAGE	480				NL	1/5
PHASE	1				NL	1
MOTOR RPM	1750				NL	1140
FAN R.P.M.					NL	Direct Drive
AMPERAGE	4.4				4	2

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM

ADDRESS BOSTON, MASSACHUSETTS DATE JULY 1, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	WCV-4	WCV-5	WCV-6
LOCATION	Penthouse	Penthouse	Penthouse
MANUFACTURER	Am Std	Am Std	Am Std
MODEL NO.	165FP	182	182
SERIAL NO.	H165DV2	SER81	

OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.			NL	1855		3994
RETURN AIR C.F.M.		NO	NL	1855		3994
O.S.A. C.F.M.		B	NL	0		0
TOTAL STATIC PRESSURE		E	NL	1.24		0.80
SUCTION PRESSURE		L	NL	0.35		-.76
DISCHARGE PRESSURE		T	NL	0.87		+.04
MOTOR H.P.	1	1	NL	2		1
VOLTAGE	240/480	240/480	240/480	240/480	240/480	240/480
PHASE	3	3	3	3	3	3
MOTOR RPM	1730	1730	1750	1750	1730	1730
FAN R.P.M.	NL	NR	NL	1560	NL	1247
AMPERAGE	3.8/1.8 1.9	NR	7.2/3.6	3.2/3.1/3.1	3.6/1.8	1.6/1.7/1.6

THOMAS YOUNG ASSOCIATES

Job Name AINES AUDITORIUM BOSTON, MASSACHUSETTS

Date JULY 1, 1982

DUCT TRAVERSE READINGS

SYSTEM WCV-3 BRANCH _____ SIZE 10x10 AREA 0.69 ACTUAL SP +.29

TRAVERSE NO.	1	2	3	4	5	6
1	1700	1900				
2	1900	1850				
3	1850	1850				
4	1800	1800				
5						
6						
7						
8						
TOTAL						
AVERAGE	1813	1850				

AVERAGE VELOCITY = 1831 TOTAL CFM = 1263

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

Job Name THOMAS YOUNG ASSOCIATES BOSTON, MASSACHUSETTS

Date JULY 2, 1982

DUCT TRAVERSE READINGS

SYSTEM WCV-5 BRANCH Suction SIZE 26x12 AREA 2.16 ACTUAL SP -.35

TRAVERSE NO.	1	2	3	4	5	6
1	900	900	900			
2	900	900	900			
3	900	1000	900			
4	900	900	900			
5	900	800	800			
6	800	800	800			
7	800	750	700			
8						
TOTAL	6100	6050	5900			
AVERAGE	871	864	843			

AVERAGE VELOCITY = 859 TOTAL CFM = 1855

Formula for calculation area:

Rectangular Duct = $\frac{W" \times H"}{144}$ = Sq.Ft.

Round Duct = $\frac{R^{2"}}{144}$ = Sq.Ft.

Flat Oval = $\frac{\frac{(H")^2}{(2)} + H" \times (W-H)}{144}$ = Sq.Ft.

THOMAS-YOUNG ASSOCIATES

JOB NAME HYNES AUDITORIUM BOSTON, MASSACHUSETTS

ADDRESS _____ DATE JULY 1, 1982

AIR MOVING EQUIPMENT TEST SHEET

UNIT NO.	WCV-7		
LOCATION	Penthouse		
MANUFACTURER	Am Std		
MODEL NO.	150		
SERIAL NO.			

OPERATING CONDITIONS	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL	SPECI-FIED	ACTUAL
TOTAL C.F.M.		NO				
RETURN AIR C.F.M.		B				
O.S.A. C.F.M.		E				
TOTAL STATIC PRESSURE		L				
SUCTION PRESSURE		T				
DISCHARGE PRESSURE						
MOTOR H.P.	1	1				
VOLTAGE	240/480	240/480				
PHASE	3	3				
MOTOR RPM	1730	NR				
FAN R.P.M.	NL	NR				
AMPERAGE	3.6/1.8	NR				

Support Documentation

Plumbing

Robert W. Sullivan Inc.

HYNES AUDITORIUM EXPANSION

Plumbing and Fire Protection

VOLUME II (SUPPORTING DOCUMENTATION)

INDEX

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	1. Domestic Water Pump	2
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	3. Fire Pump	2
	4. Domestic Hot Water Heater and Air Compressor	2

A. UTILITIES

1. COLD WATER SUPPLY

Hydrant flow tests were conducted for the above project on June 4, 1982, the following are the locations and the results:

a. Dalton Street and Scotia Street for Low Service at fire hydrant No. 1

Static Pressure	60 psi
Residual Pressure	50 psi
Flow	1980 gpm
GPM Available @ 20 psi	4190 gpm

b. Boylston Street between Fairfield Street and Hereford Street for High Service at fire hydrant No. 2.

Static Pressure	95 psi
Residual Pressure	74 psi
Flow	1980 gpm
GPM Available @ 20 psi	3940 gpm

c. Gloucester Street between Newbury Street and Boylston Street for Low Service at fire hydrant No. 3.

Static Pressure	60 psi
Residual Pressure	48 psi
Flow	3220 gpm
GPM Available @ 20 psi	6200 gpm

These results indicate an adequate water supply for both domestic and fire protection purposes.

Refer to attached sketch showing the location of fire hydrants.

2. STORM DRAINAGE

The drainage piping collect surface water and building conductors and discharges to the following storm drains in the street:

	Street Name	Size of Pipe in Inches	Roof Area in Square Feet
a.	Boylston	8	8,100
b.	Boylston	15	46,297
c.	Dalton	12	26,325
d.	Dalton	15	52,313
		Total.....	133,034 sq/ft

The following are the two land areas for the expansion on Ring Road:

a.	Hynes Auditorium	41,360 sq/ft
b.	Prudential Insurance Company	11,436 sq/ft
	Total.....	52,796 sq/ft

The storm drainage for the roof of the new expansion which is equal to the area of Ring Road will drain in the same piping draining Ring Road.

3. SANITARY SEWERS

The sanitary sewers from the building collect and discharge to the following main sewers in the street:

	Street Name	Size of Pipe in Inches	Maximum Load in in Fixture Units
a.	Boylston	8	2100
b.	Boylston	8	2100
c.	Dalton	10	3750

The sanitary sewers for the new expansion will be determined in the next phase.

B. EQUIPMENT

The following are Preliminary sizes for the equipment required for the new expansion:

1. DOMESTIC WATER PUMP

Domestic water pump shall be duplex unit, each pump capacity is 400 GPM, boosting the pressure 85 PSI, 10 H.P.

2. SEWAGE EJECTOR

Sewage ejector shall be duplex unit, each pump capacity is 200 GPM @ 30' head, 3 HP.

3. FIRE PUMP

Fire pump shall be 2500 GPM, boosting the pressure 120 PSI, 200 HP. Jockey pump shall be 5 HP.

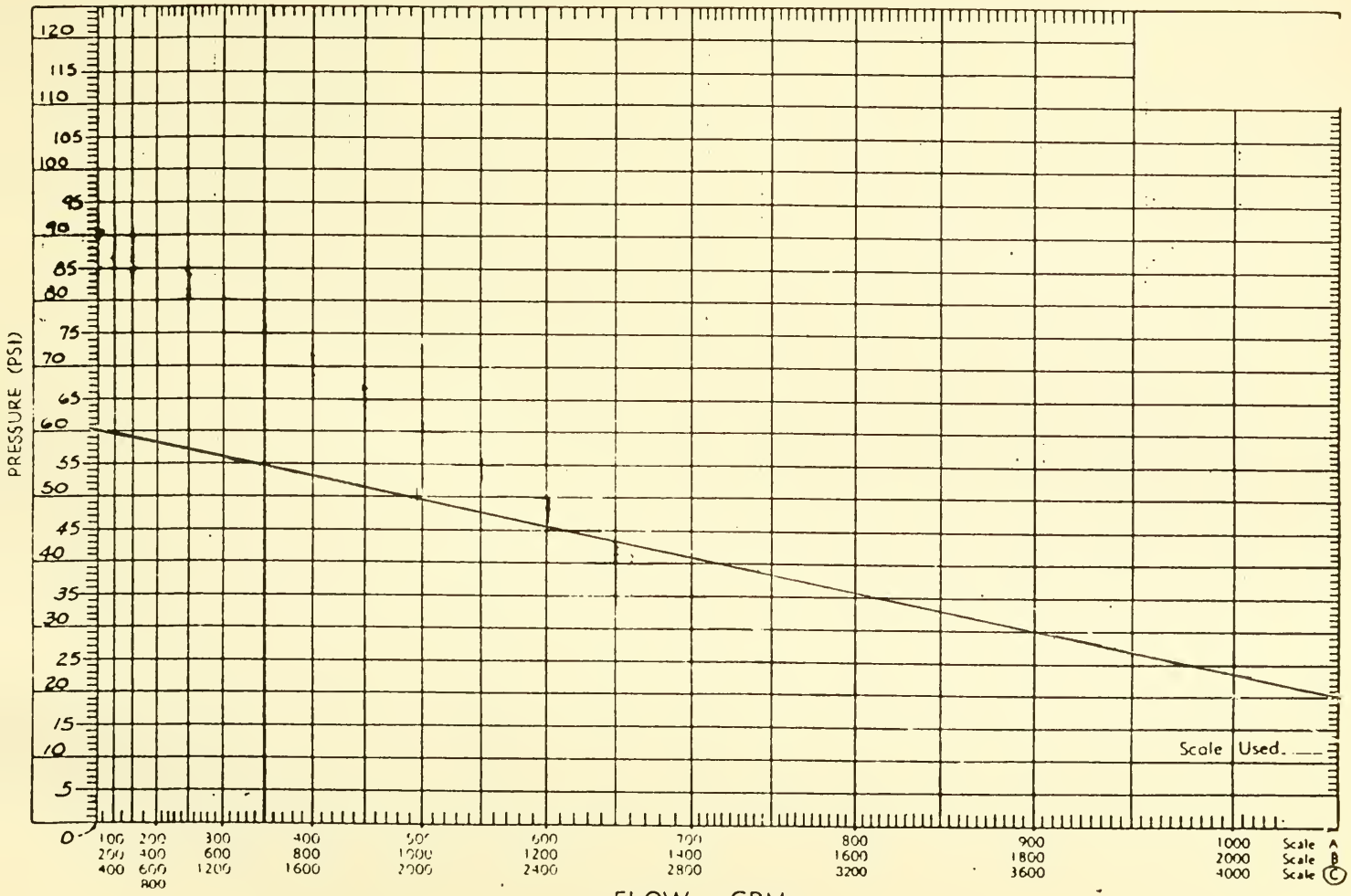
4. DOMESTIC HOT WATER HEATER AND AIR COMPRESSORS

Domestic hot water heaters, circulating pumps, air compressors and air receivers shall be determined in the next phase.

HYDRANT FLOW TEST

a. DALTON STREET & SCOTIA STREET

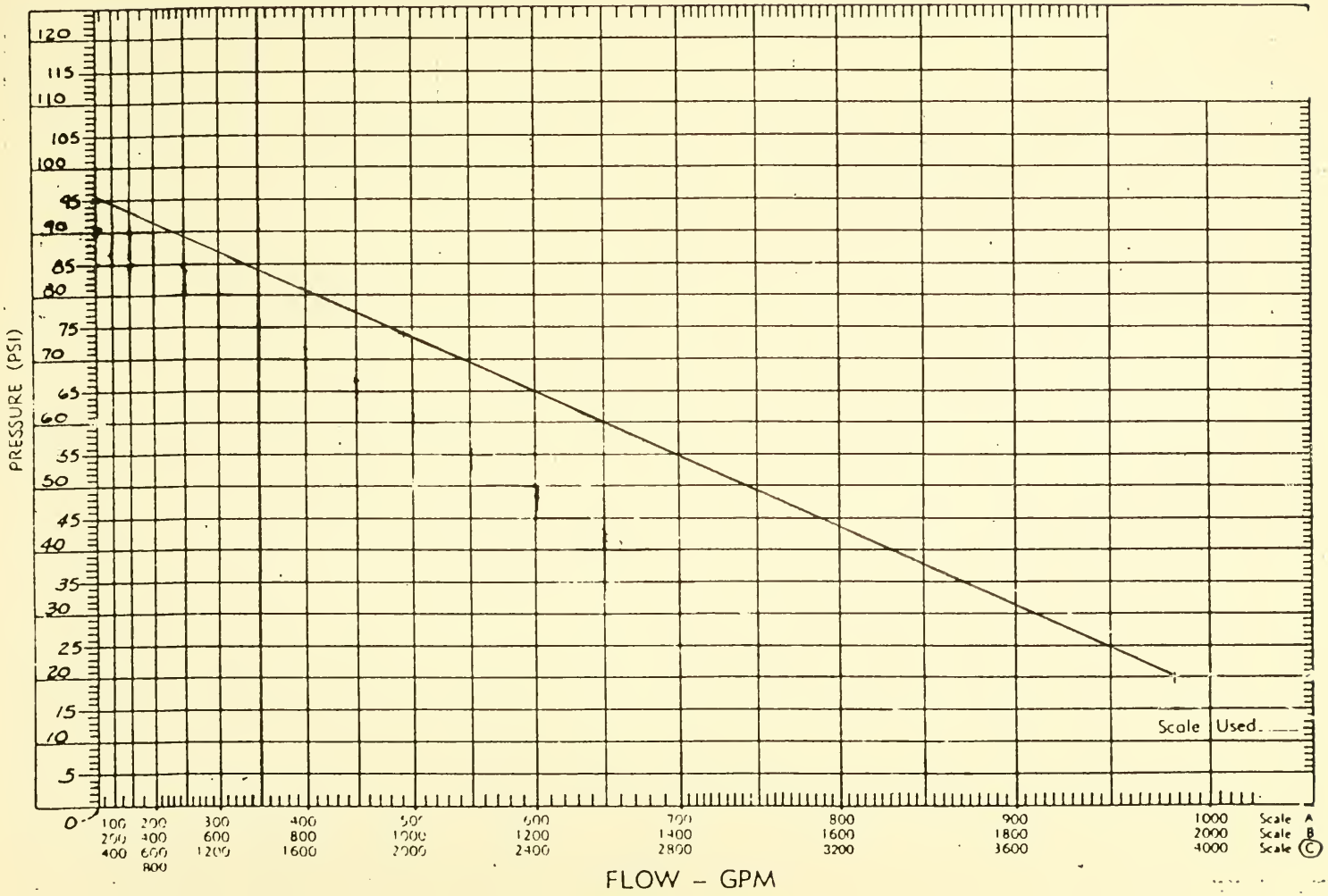
LOW SERVICE - FIRE HYDRANT NO. 2



HYDRANT FLOW TEST

b. BOYLSTON ST. BETWEEN FAIRFIELD ST. & HEREFORD ST.

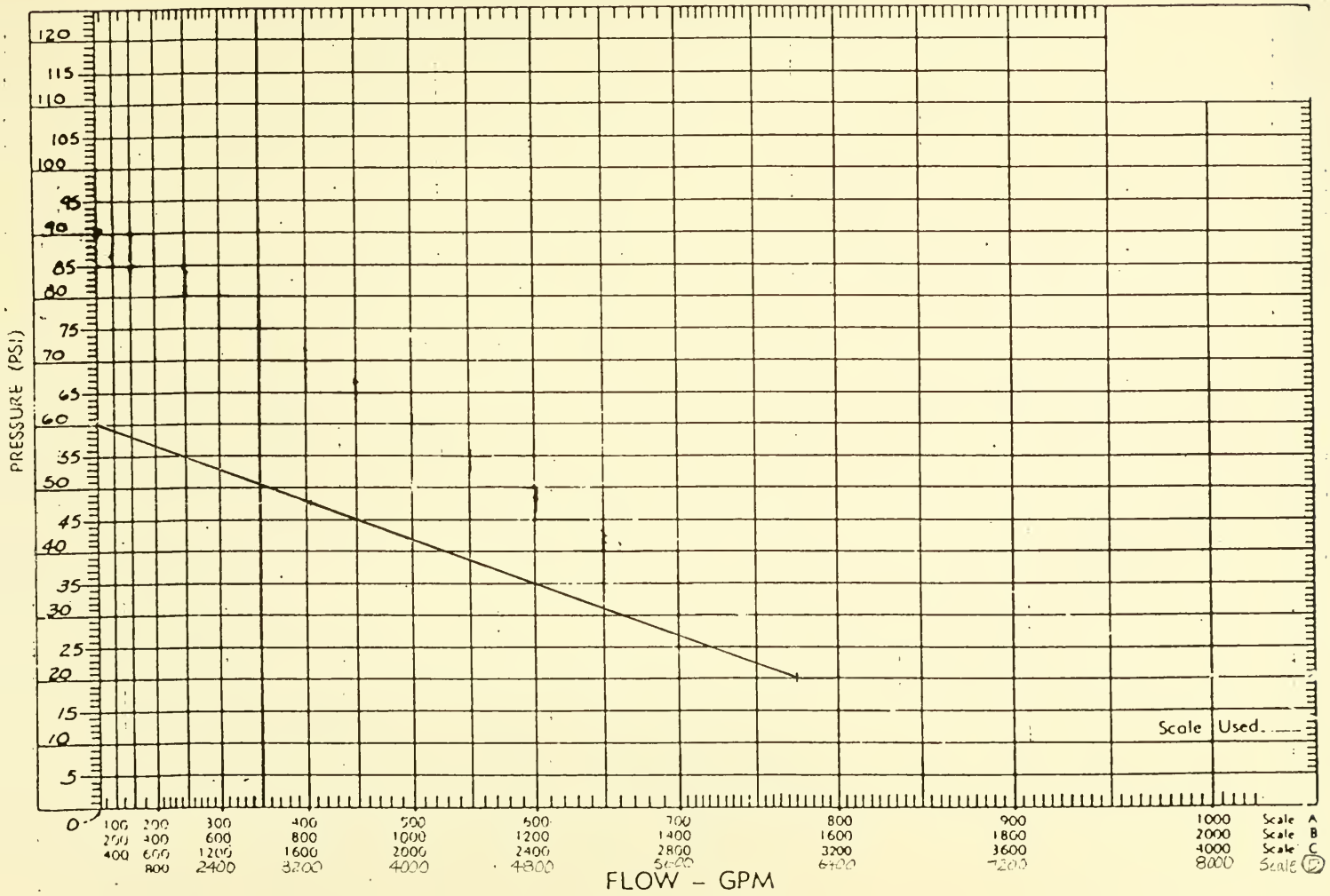
HIGH SERVICE - FIRE HYDRANT NO. 2

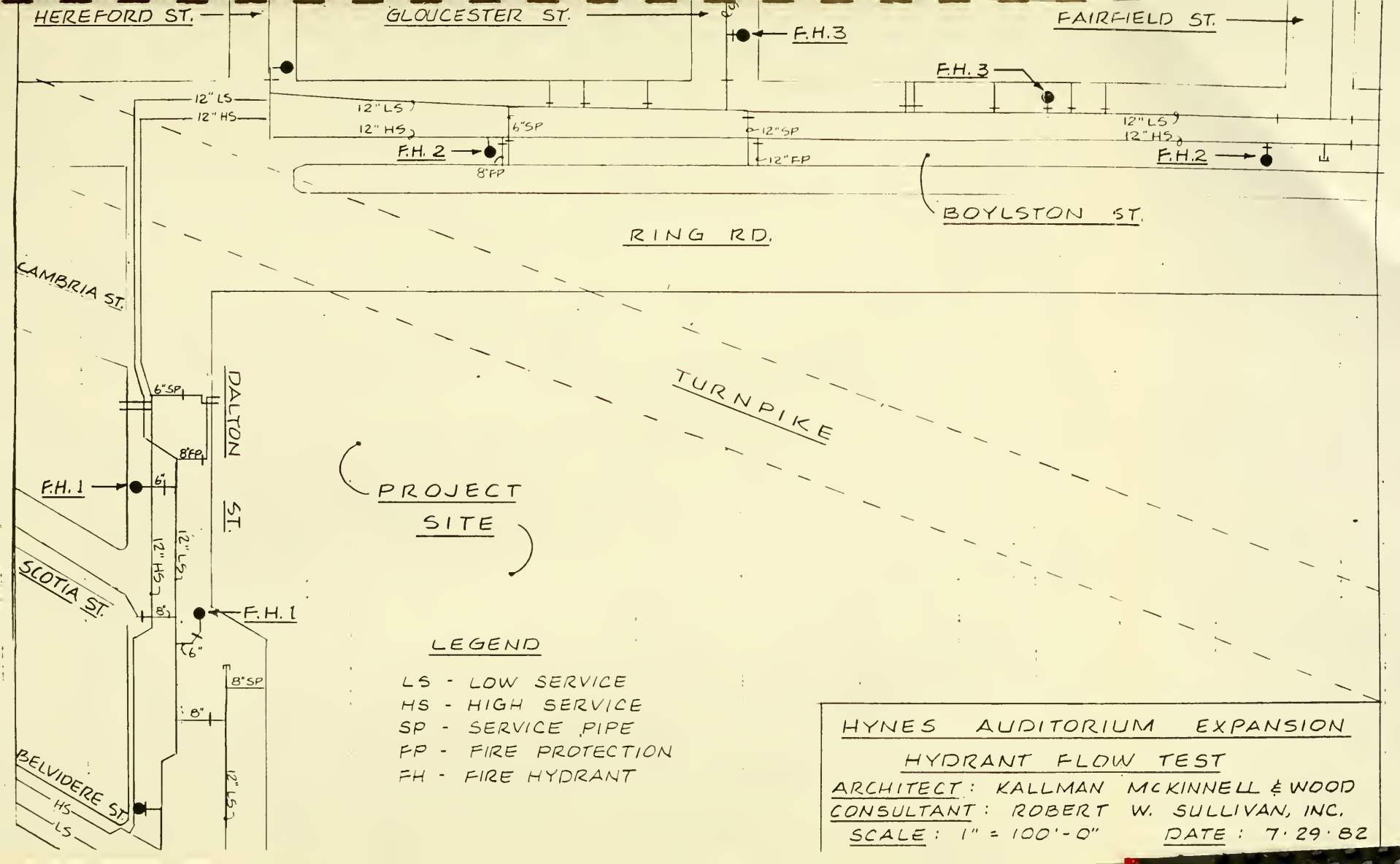


HYDRANT FLOW TEST

C. GLOUCESTER ST. BETWEEN NEWBURY ST. & BOYLSTON ST.

LOW SERVICE - FIRE HYDRANT NO. 3





LEGEND

LS - LOW SERVICE
HS - HIGH SERVICE
SP - SERVICE PIPE
FP - FIRE PROTECTION
FH - FIRE HYDRANT

HYNES AUDITORIUM EXPANSION

HYDRANT FLOW TEST

ARCHITECT: KALLMAN McKINNELL & WOOD
CONSULTANT: ROBERT W. SULLIVAN, INC.
SCALE: 1" = 100'-0" DATE: 7·29·82

Support Documentation

Electrical

Lottero & Mason Associates, Inc.

LOTTERO & MASON
ASSOCIATES, INC
Consulting Engineers
132 LINCOLN STREET
BOSTON, MA 02111
(617) 423-7367

Principals
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VICE PRESIDENT
Associates
WILLIAM J. HENNEY
RUDY A. MARAMALDI, PE
BRIAN M. McCORMACK

January 7, 1983

Boston Edison Company
800 Boylston Street, PB4
Boston, Massachusetts 02199

ATTENTION: Mr. James M. Russell

RE: Hynes Auditorium Expansion
Boston, Massachusetts
#0305-1-82

Gentlemen:

This is to confirm our understanding of numerous telephone conversations we have had over the past few months, and our discussion at a meeting in this office on January 4, 1983 regarding the expansion of the Hynes Auditorium.

1. The existing basement transformer vault on the Dalton Street side of the facility which presently contains four 1000 KVA, 13.8 KV to 277/480 volt, 3ϕ transformers is of sufficient size to accommodate an increase in transformation to four 2000 KVA transformers without altering the physical characteristics of the room. This has been confirmed by Boston Edison Co. field engineering.

2. Underground 13.8 KV primary service is available from Boylston Street to serve a new transformer vault on the lower basement level in the northeastern corner of the new addition to the building.

3. The peak maximum demand of the existing facility was 2124 KW recorded in June of 1981.

As you are aware, the HVAC system being proposed under the expansion program is unresolved. An energy study will be undertaken in the next phase of design work by the mechanical engineering discipline to ascertain the most efficient and economical HVAC system. At the completion of that study, and following a decision by the Owner, a breakdown of the preliminary electrical loads will be forwarded to you for your evaluation of transformation needed to serve the renovated existing and new structures.

Thank you for your assistance.

Very truly yours,

LOTTERO & MASON ASSOCIATES, INC.

Brian M. McCormack

Brian M. McCormack

BMM:n

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ASSOCIATES, INC.
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132 LINCOLN STREET
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RUDY A. MAPAMA, JR. PE
BRIAN M. McCORMACK

January 7, 1983

New England Telephone Company
Building Industry Consulting Service
245 State Street - Room 501
Boston, Massachusetts 02109

ATTENTION: Mr. Harold L. Dolan

RE: Hynes Auditorium Expansion
Boston, Massachusetts
#0305-1-82

Gentlemen:

This is to confirm my understanding of items discussed at our meeting in this office on January 6, 1983 concerning the proposed expansion program at the Hynes Auditorium.

1. N.E.T.Co. feels the existing four 4-inch underground service conduits from Dalton Street are sufficient to serve the 375,000 square foot expansion program of the facility.

2. The existing basement main telephone equipment frame room may need to be expanded. N.E.T.Co. field engineers will investigate and inform this office of their decision.

3. Underground telephone service is not available from Boylston Street.

We will be forwarding to you in the next phase of design work detailed information regarding interior communication requirements.

Thank you for your assistance.

Very truly yours,

LOTTERO & MASON ASSOCIATES, INC.

Brian M. McCormack

BMM:n

LOTTERO & MASON
ASSOCIATES, INC.
Consulting Engineers
132 LINCOLN STREET
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(617) 423-7367

Principals
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PRESIDENT
JOHN D. DE VEUVE, PE
VICE PRESIDENT
LOUIS A. PERCOCO, PE
VICE PRESIDENT
Associates
WILLIAM J. HENNEY
RUDY A. MARAMALDI, PE
BRIAN M. McCORMACK

January 3, 1983

Boston Fire Department
Fire Alarm Division
P. O. Box 218
Astor Station
Boston, Massachusetts 02110

ATTENTION: Superintendent John Murphy

RE: Hynes Auditorium Expansion
Boston, Massachusetts
#0305-1-82

Dear Superintendent Murphy:

This is to confirm our telephone conversation of November 10, 1982 concerning the proposed expansion of the Hynes Auditorium.

As discussed, the existing facility is connected to the city's municipal fire alarm circuit through an existing master box within the building. Under the expansion program, this connection is to be maintained.

Also, as you mentioned, the existing interior fire alarm system is quite minimal and under an expansion program of this magnitude, will need to be brought up to current fire safety standards for a building of this type in accordance with the Mass. State Building Code.

Thank you for your assistance.

Very truly yours,

LOTTERO & MASON ASSOCIATES, INC.

Brian M. McCormack

Brian M. McCormack

BMM:n

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HYNES AUDITORIUM EXPANSION

ELECTRICAL

PRELIMINARY ELECTRICAL LOAD BREAKDOWN FOR EXISTING BUILDING AND EXPANSION ADDITION

HVAC SYSTEM: ELECTRIC HEATING AND COOLING

Lighting & Receptacles	2804	KW
Exhibition Power exclusive of general lighting	3180	KW
Ventilation	3926	HP
Air Conditioning	4750	KW
	1000	HP
Heating	6250	KW
Plumbing:		
Domestic Hot Water	2000	KW
Miscellaneous Pumps	36	HP
Fire Pump	200	HP
Elevators	500	HP
Miscellaneous	100	KW

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HYNES AUDITORIUM EXPANSION

ELECTRICAL

PRELIMINARY ELECTRICAL LOAD BREAKDOWN FOR EXISTING BUILDING AND EXPANSION ADDITION

HVAC SYSTEM: STEAM HEATING AND ELECTRIC COOLING

Lighting & Receptacles	2804	KW
Exhibition Power exclusive of general lighting	3180	KW
Air Conditioning	4750	KW
	1000	HP
Heating or Ventilating	3926	HP
Plumbing:		
Miscellaneous Pumps	36	HP
Fire Pump	200	HP
Elevators	500	HP
Miscellaneous	100	KW

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ELECTRICAL

PRELIMINARY ELECTRICAL LOAD BREAKDOWN FOR EXISTING BUILDING AND EXPANSION ADDITION

HVAC SYSTEM: STEAM HEATING AND COOLING

Lighting & Receptacles	2804	KW
Exhibition Power exclusive of general lighting	3180	KW
Air Conditioning	1000	HP
Heating or Ventilating	3926	HP
Plumbing:		
Miscellaneous Pumps	36	HP
Fire Pump	200	HP
Elevators	500	HP
Miscellaneous	100	KW

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ELECTRICAL

PRELIMINARY ELECTRICAL EMERGENCY LOAD BREAKDOWN FOR EXPANSION ADDITION

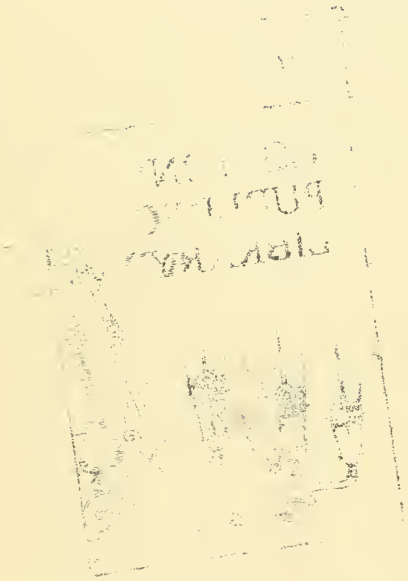
Lighting	120	KW
Auxiliary Systems:		
Fire Alarm	25	KW
Telephone	10	KW
Security	20	KW
Plumbing:		
Fire Pump	200	HP
Jockey Pump	5	HP
Sewage Ejectors	10	HP
Smoke Exhaust Systems	150	HP
Elevators	100	HP
Miscellaneous	50	KW
Estimated size of Emergency Generator	750	KW

7142 061

BACK BAY
B65M
1982

AUTHOR
Hynes Auditorium Expansion
TITLE
Final Rpt.(Vol.II-Part c)

DATE LOANED | BORROWER'S NAME



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